OCCUPATIONS

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TEN YEARS OF OCCUPATIONAL RESEARCH

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Division of Occupational Analysis and Manning Tables
Bureau of Manpower Utilization
War Manpower Commission

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I

Development of the Program

In 1934 the United States Employment Service inaugurated a systematic program of occupational research.[1] The purposes were to develop authentic information concerning industries and jobs and to discover the qualifications required for success in various occupations. Since there are approximately 30,000 separate occupations in industry and the Armed Forces, and at least 100 major industry groups, such a program must cover a wide area in order to develop effective tools to aid in occupational adjustment.

Organization of the Program

From 1934 to 1939 this work was known as the Occupational Research Program of the United States Employment Service. The program was under the direction of William H. Stead. In the early stages of the program M. R. Trabue served as Technical Director and later became a member of the Technical Board.

In 1939 William H. Stead became Chief Executive Officer, United States Employment Service. The United States Employment Service was transferred that same year from the Department of Labor to the Social Security Board. The Occupational Research Program was reorganized and was called the Occupational Analysis Section of the United States Employment Service. Since 1939 the work has been under the direction of Carroll L. Shartle, who joined the Occupational Research Program in 1935 as chief of the Worker Analysis Section.

Since February, 1943, the program has been conducted as the Division of Occupational Analysis and Manning Tables, Bureau of Manpower Utilization, War Manpower Commission.

The basic organization of the program has remained constant since 1939, although the scope of the program has been altered from time to time to meet new problems which have arisen in the war effort.

Throughout the years the program has been guided by a Technical Board. The original Technical Board was appointed in 1934 by the Secretary of Labor, following recommendations made by the Social Science Research Council and the National Research Council. The accompanying organization chart shows the present structure of the Division. The present members of the Technical Board are: J. Walter Dietz, chairman, Meredith Givens, Marion Hedges, Major Ralph Hetzel, William H. Stead, Edwin A. Lee, Millicent Pond, Leonard C. Stoll, M. R. Trabue, and Morris S. Viteles.

Underlying Principles

As the work of the Division of Occupational Analysis and Manning Tables has developed, the Technical Board has set basic recommendations which have been followed throughout the ten-year period. Some of these recommendations are as follows:

1. The research data in studying occupations and workers must be compiled at the original source if the results are to be realistic and accurate. Thus the place of study is in the plant or office in which workers are found.
2. The research or developmental activities must be closely correlated with the practical application of the research findings, in order that the research does not become detached from the needs it is required to meet in the Employment Service, in industry, in schools, and in other activities.
3. Such a research program must have continuity and stability, and must exercise careful, long-range planning. This requires stability of organization and functions.
4. The contribution of other investigations must be utilized to the fullest possible extent and the program planned in cooperation with other investigators and with

[1] W. H. Stead and W. E. Masincup, *The Occupational Research Program of the United States Employment Service* (Chicago: Public Administration Service, 1941).

DIVISION OF OCCUPATIONAL ANALYSIS & MANNING TABLES
BUREAU OF MANPOWER UTILIZATION
FEBRUARY 1944

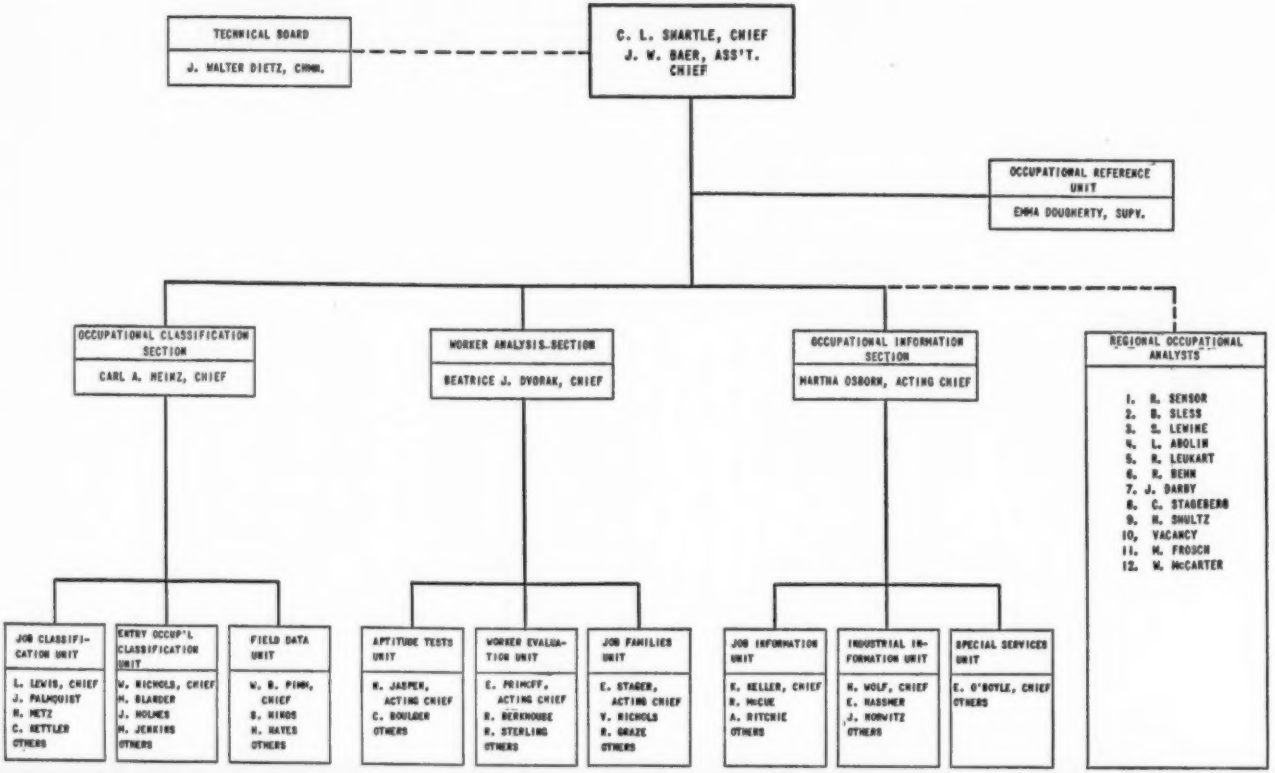


CHART I

the users of the research products, to avoid duplication and to pool all efforts.

5. While the research has been a part of the program of the United States Employment Service, it should result in information and techniques which have the widest possible usefulness not only in the Employment Service, but also by employers, unions, schools, the Armed Forces, and other domestic and foreign government agencies.

Scope of Work

The work of the Division has from the first been cooperative in nature, and has been supported not only by both federal and state funds, but also by funds of three private foundations. Twenty-five thousand employers and more than 100,000 workers, hundreds of schools and colleges, several thousand persons in government services, and all branches of the Armed Services have cooperated in the job studies and in the adaptation and use of the research materials as aids in improving occupational adjustment in this and other countries.

It was first necessary to analyze jobs at the source to discover the basic facts about them and, next, it was important to define, name, and classify these jobs in a systematic manner. In 1934 very little was known concerning the content of jobs. A title such as "machinist" or "clerk" had a wide variety of interpretations. While Census reports recorded thousands of job titles, the meaning of these titles was vague.

When the Division began to define and classify jobs, it was found necessary to outline fields of work for entry applicants. Persons without specific work experience or training had to consider fields of work open to beginners rather than specific jobs. Likewise it became apparent that all jobs were related and that they could be grouped into constellations or families, according to common job or worker characteristics. There were the machine jobs, strength jobs, accuracy jobs, dexterity jobs, and hundreds of other families which could be grouped for counseling, occupational transfer, and training. It was further apparent that such analysis was the method for showing the avenues of transfer from military to civilian jobs.

As the research developed it was found that jobs could be studied intensively from the standpoint of their physical requirements and that such knowledge of physical requirements or demands was of great use in the placement of job seekers with physical disabilities. Recently this phase of the program has received considerable attention.

Early in the program, job descriptions were developed to provide a fairly complete story about each job. These descriptions have been constantly improved and each one now includes a wide range of information which has been developed from the analyses of jobs, from the findings in defining and classifying jobs and fields of work, and from preparing job families and the physical demands of jobs.

The analysis of human skills and aptitudes has been a major phase of the Division's work throughout the years. The trade tests, now widely used by civilian agencies and the Armed Services, received the first attention; this work was closely coordinated with the program of job analysis. Studies of employed workers to develop and standardize aptitude tests began in 1935. This work reached its peak in the defense period when such tests were widely used in selecting rapid learners for training courses and war industries. The trend in the development and use of this material is now approaching an upswing in the counseling of discharged servicemen and it will reach another peak as a counseling tool in the conversion and post-war periods.

The development of the program can be briefly traced in terms of five phases which are outlined as follows:

1. *Early Stage, July 1, 1934.*—Developed job analysis techniques and made analyses in the Cotton Textile, Petroleum, and Automobile Industries. Began to plan the study of skills and aptitudes.

2. *Expansion of Coverage.*—In 1935 the job analysis phase of the program was expanded greatly. The study of aptitudes and skills was further developed. Established fifteen research centers in various parts of the country. State Employment Services began to cooperate in the development and the use of occupational analysis material.

3. *Community Centers.*—In cooperation with the American Youth Commission,

community centers were established in 1938 at Providence, Baltimore, St. Louis, and Dallas. In these cities cooperative relationships were established with the schools and other groups to apply the research findings in meeting problems of local occupational adjustment, particularly among youth. Intensified work in the development of Job Families began to stress the development and use of job information locally.

4. *Integration with Operations.*—Although the research findings, particularly Job Descriptions and Occupational Tests, were already used quite extensively by the United States Employment Service, the introduction of the *Dictionary of Occupational Titles* in 1940 marked an upward swing in the popularity of occupational analysis material in USES. Local office personnel received extensive training in job analysis and in the use of occupational tests. The development and use locally of job information expanded considerably. Research Centers were discontinued in favor of United States Employment Service state occupational units, and occupational analysts were established in each Regional Office. In the defense period local offices used Occupational Tests extensively. The headquarters staff expanded to analyze jobs in the United States Army and in defense plants and to develop Job Families to aid in the transfer of workers from peacetime work to war production.

5. *Manpower Utilization.*—By the summer of 1942 employers and government agencies were using occupational analysis materials in problems of manpower utilization, with emphasis on upgrading, job breakdown, Manning Tables, in-plant use of tests, studies of labor turnover and absenteeism, use of women, and the designation of essential and critical occupations.

In 1943 relationships were worked out between Navy jobs and civilian occupations for the United States Employment Service to use in interviewing discharged Navy personnel. By 1944 similar materials were developed in cooperation with the Army for use in the Veterans' Employment Centers of the United States Employment Service. Analyzing the physical requirements of jobs received greater emphasis. The counseling of returned servicemen also called for new testing devices.

II

Analyzing Jobs

A FIRST STEP in occupational research, as in other research, is obtaining source information. For the past ten years, the Division of Occupational Analysis and Manning Tables has secured its source information through job analysis. During this period, the results of nearly 100,000 separate job analyses have been accumulated and a standard job analysis technique has been evolved to meet the requirements of the program.

Job analysis may be defined as the process of observing jobs and reporting the pertinent facts. Such an investigation is empirical, objective, and basically simple. Information is gathered and recorded through first-hand study of the actual performance on the job. The job analyst is the middleman between the job and the person who will use the results of the research.

Systematic job analysis began with the management experiments conducted by Frederick W. Taylor at the Midvale Steel Company in 1881. The experiments consisted of time studies and analyses of jobs into units and duties. This type of analysis consisted largely of a sequential listing of the steps needed in production and the time necessary for each step. The purpose was to establish a standard time for each step in production and to fix wage rates on that basis. This type of study

in highly refined form is now a standard engineering technique. However, when personnel technicians took over job analysis, time and motion studies gave way to a method of job analysis which emphasizes the factors of jobs to which both in-plant and out-of-plant vocational counseling and personnel work may apply.

Uses of Job Analysis

Job analysis has become a flexible instrument, adaptable to many uses. Evidence of this flexibility is the wide variety of basic products of the Division that are founded on the source data resulting from job analysis. Outstanding among the products are:

Job definitions of the *Dictionary of Occupational Titles*.
Classifications of occupations for Parts II and IV of the *Dictionary*.
Job descriptions.
Interviewing aids.
Job families.
Trade tests.
Aptitude tests.

An expansion of this list to include wartime uses of job analysis by the Division would cover the following:

Determining the suitability of jobs for the employment of women.
Determining the suitability of jobs for the physically handicapped.
Determining the relative importance of jobs in the war effort.
Revising hiring requirements.
Realigning job tasks for job breakdown.
Realigning job tasks to shorten training periods.
Outlining the training courses for specific occupations.

Possible future applications of the work of the Division might be concerned with the changing of jobs from production line to batch basis in time of production curtailment, or the matching of job factors to guide the flow of labor from wartime to peacetime endeavors.

The Division's applications are not the only uses of job analysis. To the original program of time and motion study, industry has added many other applications and programs based on job analysis. One author[1] has listed more than 20 applications of job analysis techniques, including:

Job grading and classification.
Wage setting and standardization.
Provision of hiring specifications.
Classification of job duties and responsibilities.
Transfers and promotions.
Adjustment of grievances.
Establishment of a common understanding between various levels of workers and management.
Defining and outlining promotional steps.
Investigating accidents.
Indicating faulty workmanship or duplication of effort.
Maintaining, operating, and adjusting machinery.
Defining limits of authority.
Indicating cases of individual merit.
Indicating causes of personal failure.
Education and training.
Facilitating job placement.
Studies of health and fatigue.

The products of the Division outlined above serve as basic sources of information in meeting many of these problems.

Job Analysis Methods

The contribution which the program of occupational research has made to job analysis methods in general stems chiefly from the experience gained from the large volume of job analyses prepared and the modification of job analysis reporting procedures developed on the basis of this experience.

The first undertaking of the research program was to develop procedures for making job analyses and prepare a job analysis reporting form. The staff studied the literature and methods pertaining to the subject and drew up tentative procedures and forms. These constituted the basis of the methods that were used in the first field studies.

These early methods and the reporting form were designed to report everything about the job which the analyst deemed pertinent. The form represented the usual attempt to include as much information as possible in check list or single entry fashion. Later experiences, however, led to a reduction in the use of single entry and check list items and the adoption of clear, narrative statements.

[1] J. E. Zerga, *Journal of Applied Psychology*, June, 1943.

This proper balance of check list and narrative gave a more readily understandable job picture. The most recent developments in Division job analysis methods are based on procedures which have been employed successfully in a closely related field, job evaluation. These methods are designed to eliminate any remaining indefiniteness in favor of the specific.

A complete job analysis contains seven basic elements:

1. Identification Data: name the job and locate it specifically.
2. Work Performed: describe the tasks involved.
3. Performance Requirements: indicate the demands that the job places on the worker for successful performance.
4. Sources of Workers: include also necessary training and experience.
5. Comments: present the technical and general background of the job.
6. Physical Demands: point out working conditions and physical factors.
7. Worker Characteristics: the analyst's estimate of the inherent characteristics of the worker that are brought into play by the job.

Identification Data.—The job itself is not only titled and identified by this section but is also specifically located within the organization in which it falls. First is entered the name or title by which the job is commonly known in the organization. This title should preferably be the one, such as Drill Press Operator, which the workers use in referring to the job. If this title is not sufficiently descriptive of the job, such as Press Man, the title the employer uses when requesting workers should be chosen; for example, Mechanic, Drill Press. Together with the job title are entered all synonymous titles by which the job is known in the organization, as well as the number of workers of both sexes employed in the job. Once the job is identified, the analyst names the industry, the branch of the industry, and the department of the organization in which it occurs.

Work Performed.—This constitutes a statement of the purpose of the job and a concise description of the tasks performed by the worker.

The statement of job purpose serves to introduce and orient the reader to the job tasks. Such a statement for Drill Press Operator might be: "Drills the flanges of small brass, steel, and aluminum and magnesium alloy airplane fittings so the fittings can be assembled and bolted to other parts." This tells the reader why the worker drills holes and prepares him for the tasks which tell how the purpose is fulfilled.

The description of the tasks is best couched in a *numbered series* of concise statements which are developed about a logically organized outline. These statements should begin with what the worker does first on his job, carry him through all the steps in the process to the completion of the work cycle. A method, sometimes called the Job Analysis Formula, has been developed which can be used effectively in measuring the value of the information in the work-performed statements. This formula consists of four parts, the first three of which are of interest here: (1) What the worker does; (2) Why he does it; (3) How he does it; and (4) The skill involved. If the analyst translates the first three parts of the formula into questions of what, why, and how and asks them of each statement he makes regarding the work performed, and if each statement satisfactorily answers each question, the quality of the work-performed section is assured.

The analyst should realize that a long, rambling, incoherent narrative prevents an understanding of the analysis, even though it meets other standards of quality. Well-organized, well-worded, easily read, informative statements should be the goal.

Performance Requirements.—To assure the quality of all the pertinent information about a job, the fourth part of the formula must be used. This (the skill involved) measures the requirements that the job places on the worker in order that he may perform his job successfully. While these requirements cannot be presented as concretely and as objectively as the work performed on the job, there are certain basic factors which evaluate the minimum skills, knowledges, abilities, and responsibilities required of the worker by the job. The sum of these evaluations establishes the relative skill or degree of difficulty of the job.

The four basic factors on which this evaluation of skill is based are: responsibility, job knowledge, mental application, dexterity and accuracy. If the analyst obtains satisfactory information involving these factors about a job, it can be satisfactorily classified with relation to other jobs.

Responsibility as defined includes responsibility for equipment, procedures, processes, materials, and products; responsibility for the work of others; responsibility for safety of self and others; and responsibility for cooperation and for public contacts.

Job knowledge is the knowledge of processes, procedures, techniques, and operating methods required to perform the job.

Mental application, which is used for want of a more precise term, indicates the mental abilities which the job requires the worker to exert and the intensity with which they must be exerted. Among these abilities are: initiative, judgment, adjustability, versatility, and attention or the mental vigilance demanded by the job.

Dexterity and accuracy include physical deftness, speed and coordination, manipulative precision, and the designated physical tolerance to which work is done.

The analysis of Drill Press Operator might include, respectively, the following abbreviated statements for these four factors:

"Is reponsible for drilling accurately located bolt holes of specified size . . . ."
"Must know the best drilling speed for different kinds of metals . . . ."
"The tasks of this job are highly repetitive . . . ."
"Relatively little dexterity is required to locate the fittings for drilling since. . . ."

The most effective procedure for determining the performance requirements of a job is to consider that they represent an analysis of the work performed in the terms of each of the four factors. The composite result of this analysis of the work performed represents the skill involved.

Sources of Worker.—This section of the analysis is designed to indicate through required training and experience, possibilities of recruitment for the job, and conversely to point out the training and experience that a worker must have. This information is necessary for the placement officer who must replace an experienced worker; for the vocational counselor seeking to place inexperienced applicants, or who must transfer workers from a field in which they are experienced to another type of work. In addition, information necessary to solve job breakdown, upgrading, and similar job engineering problems is presented here.

In general there are two broad sources of worker skill which provide clues to worker sources: job experience, and training not necessarily associated with experience. This section of the analysis presents data on that basis.

First the analyst determines whether or not experience is required to perform the job. If experience is required, the analyst determines the specific or general experience the worker must have. He questions foremen as to what jobs they turn to for workers when fully experienced workers are not available. If experience is not required, the job is an "entry job" and the analyst must determine the education and training that fit an inexperienced worker for performing the work. When inquiring into education and training, the analyst is not so much concerned with how long such training takes but rather the specific physical and mental skills the training provides the worker.

The job of Drill Press Operator as analyzed proved to be one for which no experience was required. This was an entry job, and so the analyst determined the training that was needed to prepare an inexperienced worker for the job. Among the notations appeared the following: "Vocational training courses covering metalworking machines." From this training the worker should have acquired: "A knowledge of the cutting characteristics of various metals and alloys and. . . ."

Comments.—When reporting the analysis of a job, the job analyst must provide technical and general information regarding the job. He can furnish this information through comments, giving descriptions of machines, tools, and other equipment, materials, and supplies. He also defines any technical terms. In concluding his comments the analyst makes any general additional statements which he feels will further clarify the picture of the job.

In commenting on the job of Drill Press

Operator, the analyst might describe the drill press used, associated equipment such as special chucks and fixtures, and describe the fittings worked on. He might comment on peculiarities such as the system of delivering fittings to the worker and specialized assignments.

Once the analyst has determined the what, why, how, and the skill involved for a given job, he is in a position to consider the specialized items associated with the analysis.

Physical Demands.—Under performance requirements four factors were discussed as being vitally important considerations regarding a job and were designated as having a specific bearing on job classification, job difficulty, and job differentiation. In addition to these four, there are two other factors—working conditions and physical requirements—which often prove to be of great value in rounding out the job picture, through their bearing on job skill or job difficulty. The analyst obtains information regarding these two factors by analyzing the physical demands that a job makes on a worker. In such an analysis he considers approximately 54 specific items relating to the physical activities and the working conditions of jobs. He checks these items and prepares a statement describing their relation to each other and to the tasks of the job. (See page 416.)

The information thus presented not only rounds out the performance requirements of the job but also provides specific data relating to the suitability of various types of physically limited workers, such as the physically handicapped, women, and youth.

Worker Characteristics.—The basic abilities or personal traits required of a worker to perform his job satisfactorily must be known in placing and transferring workers. To be of value this information must be presented in terms of general worker characteristics requirements which, although they are revealed by specific tasks performed by the worker, can be used in comparing and evaluating the job with other jobs with quite different specific tasks. To obtain this information the job analyst checks approximately 47 characteristics that may be required.

This information forms a basis for establishing groups or "families" of jobs (see pages 409 to 414)—worker sources for upgradings, transfers, or selections.

Job Analysis Training

Training and practice in job analysis are necessary for all persons who attempt to use job information. Experience has proved that counselors and interviewers work more effectively after training and experience in job analysis, even though they do not become expert analysts. Many experienced counselors have reported that they never really understood what a job was until they had analyzed one.

Qualities of a Job Analyst.—Strong and Uhrbrock[2] in 1923 described a job analyst as a salesman and an opportunist who had patience and tact, who won confidence and cooperation, and who had a sense of relative values. Edward Salner[3] in 1938 added to the job analyst the qualities of technical or industrial familiarity, intellectual agility, ability to record observations in writing, and the ability to get along with others. If to these we add fundamental inquisitiveness, good memory, and good organizational ability, the picture of a job analyst is virtually complete. These, of course, represent the acme of qualities. As in many other jobs of this nature, however, many degrees and combinations of these qualities are acceptable. Even though an individual possesses these qualities, his qualifications are not complete unless he is trained in the principles and procedures of job analysis.

Job Analysis Training Methods.—In training personnel workers, vocational counselors, prospective job analysts, and others, experience has proved that job analysis training alone does not make a proficient analyst. Furthermore, the successful use of job analysis procedures depends on the analyst's understanding of the underlying concepts, not on the details of format and check lists of the job analysis reporting form.

Job analysis training in the Division usually is given through a formal course which is part of the Division's Induction Training In-

[2] E. K. Strong and R. P. Uhrbrock, *Job Analysis and the Curriculum* (Baltimore: Williams and Wilkins, 1923).

[3] Edward Salner, "Job Analysts," *Personnel Journal*, XVII, May, 1938, pp. 31–35.

stitute, though the training may be given on an individual basis or obtained through self-study. However given, the training begins with reading and discussion which is followed immediately by practice in the procedures discussed; criticism and correction are given until the points are satisfactorily understood and presented.

The first step of job analysis training is to review the text[4] used. This review orients the trainee with respect to the purpose of job analysis, the material covered, and the terminology employed. Then the job is chosen on which the laboratory work will be based. This job should be analyzed by observation in a plant, if possible. If such facilities are not available, a hypothetical job with which the trainee is familiar, is selected.

When the laboratory job has been selected, each section of the job analysis is studied separately until all points are understood completely. The trainee prepares each section of the job analysis on the basis of the laboratory job, discussing each step with his instructor. The section is then revised according to the criticisms received. This procedure is followed until each section of the analysis has been presented completely and adequately. If the trainee is studying job analysis without supervision, he resorts to the text on the completion of each section and prepares a careful self-criticism of the section. When all sections of the analysis have been reviewed, they are combined into a unit and considered as a complete laboratory job analysis.

If this procedure of training is followed, the trainee first prepares the identification data, followed successively by the work performed, performance requirements, sources of workers, physical demands, and worker characteristics. Having taken the first step toward learning job analysis, the trainee is ready for practice in an employing establishment—practice, without which, he cannot become a proficient analyst.

To anyone beginning practice work in analyzing jobs in industrial or commercial establishments there are certain "do's and don'ts" that should be pointed out:

1. Do not confine the analysis to work done by the best worker.
2. Make sure the worker knows who you are and why you are there.
3. Show the worker that he is helping to find facts.
4. Be interested in the information the worker gives you.
5. Talk to the worker in his own language.
6. Do not argue with the worker nor tell him how to do his job.
7. Do not confuse the work done by the worker with that done by the machine, and do not confuse work processes with the abilities required to carry them on.
8. Do not overlook anything. Investigate a point completely before discarding it.
9. When reporting on the analysis confine yourself to statements of fact.

As was pointed out previously, training in job analysis alone does not make one proficient. Such proficiency is achieved only by long, hard work in the practical analysis of jobs under the supervision of a competent analyst. But again, as has been pointed out, the value of the knowledge of job analysis is not confined to the professional job analyst but extends to all who use job information.

[4] The standard text of the Division is its *Training and Reference Manual for Job Analysis*, War Manpower Commission, U. S. Government Printing Office, Washington, D. C., 1944.

III

Naming, Defining, and Classifying Jobs

THE JOB ANALYSES made by the Division revealed that the names borne by jobs varied from locality to locality and from plant to plant. This variation emphasized the need for the preparation of a document that would define job titles and present such data according to a classification structure. Such a document would give all those who use occupational terminology a standard index of job titles and job definitions. A wealth of information was procured by 1937 through the 55,000 analyses of jobs in American industry made by the Division. A similar project, undertaken in Great Britain ten years before (1927), resulted in the publication of a *Dictionary of Occupational Terms*, containing 16,837 definitions of 29,106 terms. The British document originally was prepared for military purposes, since much confusion in job terminology had been found during World War I.

DICTIONARY OF OCCUPATIONAL TITLES—PARTS I AND II

The American dictionary containing job titles, job definitions, and classifications was completed in 1939 by the Division and released the following year as the *Dictionary of Occupational Titles*. The occupational data contained in Parts I and II cover about 90 per cent of the American workers employed at that time. Part I, "Definitions of Titles," contains job definitions for 17,452 separate jobs known by 29,744 job titles. Part II, "Titles and Codes," contains all the job titles listed in groups according to their occupational code numbers, of which there are 7,000. Part III, "Conversion Tables," a temporary volume, contains alphabetically, numerically arranged tables showing the possible equivalents among the new code numbers for the code numbers and job titles appearing in the old code book, "Occupational Titles and Codes for Use in Public Employment Offices." This volume was designed to facilitate the conversion of registration files in public Employment Offices to the code structure in the *Dictionary*. It is now obsolete and out of print. In addition, there is a *Supplement* to Parts I and II of the *Dictionary* that contains an additional 4,201 job definitions known by 6,619 separate job titles, thus making a total of 21,653 defined jobs known by 36,363 job titles.

The *Dictionary* is one of the most widely used documents on occupations in this country. More than 50,000 copies are used by the United States Employment Service, schools, libraries, all branches of the Armed Forces, Selective Service, other government agencies, and industrial organizations. Other countries such as Canada, Great Britain, Australia, France, Holland, Brazil, Chile, and Russia are also using it.

PREPARING JOB DEFINITIONS

The preparation of a job definition and classification begins with the assembling and analysis of source materials. These source materials are primarily job analyses which are comprehensive reports of jobs in their respective working situations. Additional source materials include job descriptions and other occupational data prepared by industrial organizations, labor unions, professional societies, and government agencies and other interested groups. These data are examined carefully to determine that all the information relates to the same job. After it has been established that the source information deals with the same occupation, a precise and detailed analysis of the data is made to determine the essential elements of the job. Next, the job can be defined. A job definition should contain all the essential and significant facts and should be stated so that the job can be clearly understood and distinguished from all other jobs.

Naming and Defining the Job.—A job definition in the *Dictionary* is composed of four parts: (1) the job titles, (2) the industrial designation or work activity with which the job is identified, (3) the classification, and

(4) a brief description of the job duties. Where a job is known by a number of different titles, the title assigned is the one by which the job is most widely known, all other titles by which the job is known being indicated as alternates. The occupation concerned with making soft-pie fillers, for example, is known by the titles *filling mixer; milk-pie man; pie-canter mixer; pie-filling mixer; soft-filling mixer;* and *soft-pie man*. The title *Pie-Filling Mixer* was selected as the main title because the data indicated that it is the most widely used in the bakery products industry and would therefore be most commonly recognized.

The industrial designation attached to the job indicates the industry or type of activity with which the job is identified. It is not unusual for a given job to occur in other industries, hence the industrial designation should be considered as indicative and not restrictive.

The body of the definition begins with a statement of the over-all aspect of the job, including the "why" or purpose of the job. The remainder of the job definition tells a more detailed story and includes information concerning what is involved in performing the duties of the job, responsibilities, skills involved, requirements, and other pertinent factors. The following illustrates such a job definition in the *Dictionary:*

FOOD AND DRUG INSPECTOR; drug and food inspector (gov. ser.) 0-95.11. Inspects establishments where foods and drugs are manufactured, handled, stored, or sold, to enforce the city, state, and national standards of sanitation, purity, and grading: visits establishments manufacturing, storing, handling, or selling foods or drugs, and investigates the sanitary conditions of the establishments and the health of the persons handling the products; collects samples of products for bacteriological and chemical analysis by FOOD BACTERIOLOGIST and FOOD ANALYST; condemns, destroys, or stops the sale of all impure, adulterated, or misbranded products and secures evidence of violation of food and drug laws to be used in prosecution of offender; sees that all establishments are properly licensed; prepares written reports on each establishment visited.

In some job definitions it is necessary to cover working conditions, job requirements, and other factors, as well as duties. See, for example, the last three statements in the following definition:

SMOKE CHASER; fire chaser (gov. ser.) 0-68.22. Is stationed on high ridge or other point commanding a view of small area of forest and keeps sharp lookout for signs of fire; if fire is sighted, goes to fire and attempts to suppress it and if unable to do so, telephones for assistance. In western forests, lives alone and isolated for periods of three or four months, doing own cooking, laundering, and other domestic duties. In eastern forests, the period of isolation may be one month or less. Sometimes SMOKE CHASERS are stationed in same tower as FIRE LOOKOUT.

One of the most important aspects of a job is its relation to other jobs. Such relationships are brought out in job definitions by means of various reference devices to indicate the other jobs that have significant bearing on the job in question and also to obviate the repetition of elements that may be common to more than one job.

Classifying the Job.—The occupational classification assigned to a job serves to identify the job and also to indicate its relation to all other occupations in the classification structure. The process of assigning a classification consists of several steps: (1) the determination of the major field of activity with which the job is identified; (2) an examination of the classification structure in order to determine the specific group of occupations to which the job should be allocated; (3) a careful study of the occupations classified in that group to determine whether the job being classified is covered or related to other occupations, or is a separate and distinct occupation. If the latter is the case, a specific code number from that grouping is assigned to the job. In determining the classification of an occupation, factors in addition to the job duties must be considered. Job requirements, such as educational qualifications, experience and training, responsibility, and other factors play an important part in allocating an occupation to a specific classification.

An example of this procedure would be the classification of the job of Food and Drug Inspector previously mentioned. The job information for this occupation reveals that it is highly responsible, requires an intimate knowledge of foods and drugs, is concerned with law enforcement, and is managerial in nature. These factors identify this job with the broad grouping of professional and managerial occupations. An examination of this

portion of the *Dictionary* classification structure will reveal a specific occupational group for public service inspectors, not elsewhere classified. A careful study of this specific group shows that food and sanitary inspectors are allocated there. A further examination of the jobs classified in this group reveals that Food and Drug Inspector has not been covered and is not related to other occupations classified here. Thus, it is a new occupation to be classified, and a specific code number from this group is assigned to the job of Food and Drug Inspector.

Classification Structure

Until 1940 there was no standard classification through which the various occupational statistics could be related and interpreted. This lack prevented the effective analysis of occupational characteristics and trends. To remedy this situation, an Occupational Classification Committee was formed, sponsored by the Central Statistical Board and the American Statistical Association. Committee members included representatives of the Employment Service and other interested organizations. After much labor they evolved a standard occupational classification which serves as a common denominator for comparing the occupational statistics of the various government agencies. This classification is embodied in the *Convertibility List of Occupations* released by the Bureau of the Budget in 1940.[1]

The two classification schemes most closely related to the *Convertibility List* and most completely indexed in the document are the occupational classification of the 1940 Census of Population and the occupational classification of the *Dictionary*.[2] A comparison of these classification systems appears on page 400.

The occupational classification structure in the *Dictionary of Occupational Titles* follows closely the standard occupational classification, with the result that Employment Service statistics are comparable with those of other government agencies. This classification structure contains a number of occupational groups established according to skill level, numerical frequency, and significance of the occupations in the American economy. Specific jobs are classified in these groups according to similarity of work performed and performance requirements. Occupations that cannot be so classified are placed in groups which are named for the industry or process in which they are most commonly found. The

[1] G. L. Palmer, "The Convertibility List of Occupations and the Problems of Developing It," *Journal of the American Statistical Association*, Vol. 34, December, 1939, pp. 693–708.

[2] *Alphabetical Index of Occupations and Industries*, Sixteenth Census of the United States. U. S. Government Printing Office, 1940. *Classified Index of Occupations*, Sixteenth Census of the United States. U. S. Government Printing Office, 1940.

Table I

Major Occupational Groups	3-Digit Groups*	No. of Classifications	No. of Job Definitions
0- Professional and managerial occupations	67	806	1,611
1- Clerical and sales occupations	55	588	1,331
2- Service occupations	42	296	567
3- Agricultural, fishery, forestry, and kindred occupations	40	177	310
4- 5- Skilled occupations 6-	149	1,761	3,528
7- 8- Semiskilled occupations	133	4,660	7,423
9- Unskilled occupations	85	581	6,883
Total	571	8,869	21,653

* Occupational title group.

occupations in the *Dictionary* are first divided into seven broad groups or categories. The occupations in each of these groups are then subdivided into twelve major subdivisions. These groups in turn are further divided into more limited groups of occupations, each of which has an occupational title. There are 571 such occupational title groups. These 571 occupational groups in turn contain 8,869 specific occupational classifications.

Table I shows the major occupational groups established in the *Dictionary* and also the number of classifications and job definitions that are embraced by each group at the present time.

The digits of the code numbers in this classification indicate the relationships among the occupations. The first digits show the broad occupational groups; each successive digit shows progressively more limited groups and consequently closer occupational relationships. The code numbers also indicate skill level and other occupational factors. For example, the code numbers of Sheet-Metal - Fabricating - Machine Operator, 6-94.202 and Flange Breaker, 6-94.211 in the automobile manufacturing industry indicate that these jobs are semiskilled, requiring only a few months of on-the-job training, and that the typical trade school graduate who has had courses in sheet metal work will be able to acquire the specific skills demanded by the occupations in a relatively brief time. The code numbers for Coppersmith, 4-80.010 and Sheet-Metal Worker, Aircraft, 4-80.050 give analogous information on jobs at the skilled level.

The degree and kind of relationships among occupations are also indicated in the *Dictionary* classification structure by the proximity of the code numbers, both laterally and vertically. Welder, Butt, 6-85.020 and Welder, Bar, 6-85.010 are closely related since the first four digits of their code numbers are identical. They are not so closely related to Arc Cutter, 6-85.280, although the relationship is still strong as indicated by the fact that all three occupations have the first three digits of their code numbers in common. They are much more closely related to each other than to the job of Tin-Shop Inspector, 6-93.075, as indicated by the differences in the code numbers.

Vertically, the nature of the relationships between jobs can be seen by comparison of the code number of Welder, Arc, 4-85.020, with those of the semiskilled welding occupations already mentioned. It is evident that the chief difference is in the first digit, which indicates the level of skill. Thus, except for that digit, the codes of Welder, Arc, 4-85.020 and Welder, Butt, 6-85.020 are identical. This indicates that the types of skills of these jobs are approximately the same and that the chief difference between them is the degree of skill demanded by the jobs.

Present Uses of the "Dictionary of Occupational Titles"

The chief use of the *Dictionary* and its classification system is in interviewing or counseling when it is essential to have accurate information concerning jobs and their relationships. Through the data in the *Dictionary*, work histories of job seekers can be identified in terms of specific jobs and classified accordingly. The *Dictionary* job definitions are composites which reflect jobs as they typically exist rather than jobs as they occur in given organizations. Therefore, the job definitions must be interpreted in terms of local job situations.

In matching workers and jobs, the *Dictionary* becomes an invaluable tool. The counselor must use his own judgment to determine the essential agreement of the job definitions in the *Dictionary* with the job seeker's work experience. After a determination has been made, supplemental information can be recorded as needed, to amplify other assets possessed by the job seeker. This procedure gives an accurate inventory of the work experiences and qualifications of job seekers. On the other hand, job openings can be identified in terms of *Dictionary* job definitions and codes.

If both worker and job are properly identified and classified, then the matching process has taken place. This procedure is used in all United States Employment Service offices with a very large measure of success. The occupational statistics collected on the basis of these records have provided data to determine trends in occupations, employment, and unemployment.

COMPARISON OF OCCUPATIONAL CLASSIFICATION SYSTEMS

CLASSIFICATION SYSTEM	BASIS OF CLASSIFICATION	PRINCIPAL PURPOSE	OTHER USES	SOURCE DATA	STRUCTURE	COMMENTS
Bureau of the Budget Convertibility List of Occupations (1940)	Groups established according to: a. Numerical frequency of occupations. b. By industry of occurrence. Allocation of specific items to specific groups according to similarity of work performed and job requirements.	To provide a standard occupational classification scheme for the purpose of achieving comparability among various occupational statistics.		Data from: a. Index of the Bureau of the Census. b. Dictionary of Occupational Titles, Parts I and II. c. Bureau of Labor Statistics. d. Other	9 Major groups 8 Subgroups 223 Occupational Titles exclusive of subdivisions by industry. 327 Occupational Titles including industry subdivisions.	a. Used only as a standard or basis for the selection or development of an occupational classification for a specific purpose. b. Index of the Bureau of the Census of Population and the Dictionary of Occupational Titles are the recommended indexes.
Bureau of the Census Classified Index of Occupations: 1940 Alphabetical Index of Occupations and Industries: 1940	An adaptation of the Convertibility List of Occupations to census technical and administrative needs and limitations, mainly based on the following factors: a. Similarity of work performed and job requirements. b. Reliability of returns for specific occupational titles. c. Numerical frequencies of the occupations. d. Industry of occurrence.	To classify occupational returns from household type of census enumeration for population statistics.	For the classification of occupational data for statistical purposes where the returns are received by job title without the benefit of descriptions of the job duties.	a. Census returns by occupations over the years. b. Research as to facts about jobs represented by the job titles enumerated in the census.	11 Major groups 451 Occupational Titles including subdivisions by industry. (Three Digit) 236 Occupational Titles exclusive of subdivisions by industry. (Three Digit) 167 Intermediate occupational titles for males. 76 Intermediate occupational titles for females. 152 Industry classifications. (Two Digit)	Lack of job definitions does not permit classification of a single job title used for more than one job to all possible occupational titles, unless there is a job difference because of the industry of occurrence. Code usually does not permit the identification of specific jobs.
Division of Occupational Analysis and Manning Tables DICTIONARY OF OCCUPATIONAL TITLES Definitions of Titles Part I Titles and Codes Part II Supplement (1940)	Groups established according to: a. Numerical frequency of occupations and level of skill required. b. Specific jobs classified to groups according to similarity of work performed, and performance requirements. c. Jobs which cannot be classified in these groupings are classified in groups which are named for the industry or process in which they are most commonly found.	To classify accurately applicants for work, according to work experience gleaned from a personal interview, and for the collection of employment statistics.	a. Armed forces - classification and assignment of personnel. b. Private industry - classify jobs in preparing Manning Tables and plant composition studies. c. U. S. Civil Service Commission and other government agencies - classification of personnel and preparation of job statistics. d. Educational institutions - vocational counseling. e. Reference - source of information on jobs in American Economy.	a. Job analysis schedules prepared from actual observation of workers on the job. b. Information from U. S. Employment Offices. c. Data from Manning Tables. d. Job descriptions prepared by industry. e. Research by Occupational Analysts.	7 Major groups 12 Major subdivisions 571 Occupational Titles (three digit groups) 6,619 Specific occupations - (five or six digit codes) 21,665 Job definitions	a. Lacks coverage of about 15% of jobs in American Economy. b. Lack of differentiation of various classes (or skill levels) of the same job limits use for wage evaluation purposes. c. Classification of Professional, Semiprofessional and Managerial occupations is too broad for use where the experience of many persons is classified in a single file.
Entry-Occupational Classification: Part IV (1941)	Similarity of tasks and worker requirements of entry occupations.	To classify inexperienced applicants in public employment offices who cannot be assigned a meaningful classification from Part I of the Dictionary.	a. Classification of persons who wish or who must change to new kind of work. b. Guidance of persons desiring to know kinds of entry occupations and non-entry occupations related to their interests, training and abilities. c. Classification of training courses. d. In statistical reporting, enables the comparison of figures on experienced, inexperienced, and trainees.	a. Job analysis schedules. b. School training data. c. Apprenticeship or in-plant training data. d. Worker characteristics data.	208 Classifications at finest levels of breakdown. Classifications pyramided to take account of varying stages of development of inexperienced applicants. 22 three-digit 60 four-digit 135 five-digit 186 six-digit	a. Only most common of many avenues of entry for non-entry occupations are shown. b. Many kinds of training, aptitudes, and worker characteristics can be related to widely diversified groups of occupations. Only the more obvious are shown. c. Only about 60% of known entry occupations have been related to the present structure.

CHART II

The Armed Forces have used the *Dictionary* in order to assess the occupational skills of men going into uniform. The Army, Navy, Marine Corps, Coast Guard, and their women's services found that most civilian occupational activities are defined and classified in the *Dictionary of Occupational Titles*. It has become an indispensable tool in facilitating the interviewing and assignment of personnel. The Services early in the War found definite relationships between civilian activities and military assignments. Thus, by establishing the occupational civilian backgrounds of individuals it was possible to make more accurate military assignments. More than 10,000 copies of the *Dictionary* have been used in posts located all over the world.

Industrial organizations use the *Dictionary* as an aid in recruitment and placement. Many organizations have adopted the *Dictionary* classification in setting up their personnel records. Others have adapted the classification structure, using the first three or four digits as necessary to suit their specific needs. The advent of Selective Service raised the problem of making accurate determinations in regard to occupational deferments, and when the drafting of men began to make serious inroads on the available manpower supply, the Manning Table plan was introduced to provide for the orderly withdrawal of men from their jobs. The Selective Service local boards were supplied with copies of the *Dictionary* to aid in making decisions on occupations. Plants participating in the Manning Table plan identify the common job titles used in the plant with the job titles and definitions included in the *Dictionary*, to arrive at a common understanding of the content of the jobs. This facilitated improved utilization of manpower in industry, thereby increasing the effectiveness of the available labor force.[3]

The *Dictionary* has proved valuable to those interested in labor and occupations, as well as to workers in industrial personnel, vocational training and guidance. Libraries have found that the *Dictionary* classification provides an excellent scheme for filing occupational information. With certain modifications it has been used for more than a year by the Bureau of Guidance of the New York State Education Department.[4] The War Labor Board has used the *Dictionary* as an informational aid in determining and setting wage rates. The United States Civil Service Commission is using the *Dictionary* in classifying and coding the work histories of applicants for federal employment. Other federal agencies such as the Board of War Communications, War Production Board, Petroleum Administration for War, and the Office of War Transportation have found the *Dictionary* an aid in solving occupational problems.

Future Plans for the Dictionary

The *Dictionary*'s usefulness has expanded far beyond the original conception of providing a working tool for public Employment Offices. In planning revisions its wide-spread use is being kept in mind.

The role of the *Dictionary* will probably become more significant in the aftermath of World War II, during the demobilization and return to civilian employment of millions of veterans. Accordingly, a revised version was scheduled for distribution at the end of the war.

If this second edition is published soon, it may closely resemble the first, except that job coverage will be more complete. As soon as possible thereafter, another (third) edition may be published to meet post-war demands and conditions. Some of the considerations for future revisions of the *Dictionary* are as follows:

Since placement of returning veterans is a major post-war problem, it is contemplated that the second edition of the *Dictionary* contain definitions of Army jobs. At the request of the War Department more than 9,000 job analyses were made by job analysts who interviewed men performing specialist occupations at Army posts all over the country. These data are being carefully examined and it is expected that 800 new definitions of Army jobs will result. It has been found that certain Army jobs are exact counterparts of civilian jobs, others are modifications of or closely related to civilian jobs, and the remainder are of a specialized military nature. The integra-

[3] C. L. Shartle, "The Manning Table—A Personnel Blue-Print," Occupations, XXII, Oct., 1943, pp. 20–23.

[4] R. M. Handville, "How to File Occupational Information," Occupations, XXII, Oct., 1943, pp. 35–38.

DISTRIBUTION OF THE DICTIONARY OF OCCUPATIONAL TITLES

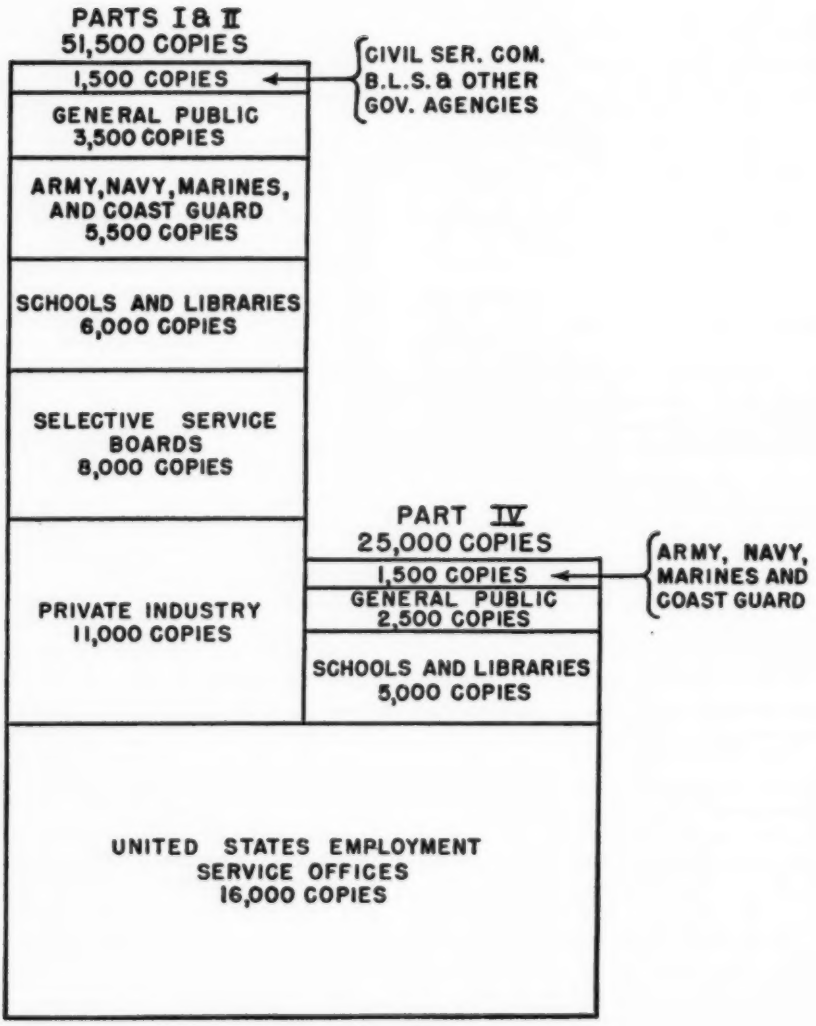


CHART III

tion of these data in the *Dictionary* has significance not only to the Armed Forces but also to the counselor in the training and placement of discharged servicemen.

Another major post-war problem in which the *Dictionary of Occupational Titles* will be of valuable assistance is the transfer of civilian war workers to new types of post-war civilian industry. Many war industries may be able to retain most of their war workers after a brief period of reengineering and retooling; others, such as arsenals and ammunition plants, will probably be forced to discharge thousands of workers. These discharged workers must be transferred to other jobs with a maximum use of already acquired skills and experiences.

Significant assistance in this transfer of workers will be rendered by personnel procedures already in operation that have been based on the classification structure of the *Dictionary of Occupational Titles*. Since plant Manning Tables have revealed the occupational picture of many war industries in terms of the *Dictionary of Occupational Titles*, one shall in many instances know exactly what workers in which occupations in war plants will be displaced by peacetime conversions. This information will permit more intelligent placement planning, and may become a factor in deciding suitability of specific plant conversions.

In order to facilitate the transfer of workers, the *Dictionary* should record, define, and classify occupations not presently covered, and show within its classification structure the relationship of new jobs and new occupations to existing jobs and occupations. Many new industries have sprung up in the last five years, others have grown out of the war, and the post-war period will doubtless produce additional new civilian activities which must be analyzed and defined. In 1941 it was estimated that at least 80 per cent of the jobs and 90 per cent of the workers in the United States were covered by the definitions and classifications in the *Dictionary*. Even with the increased job coverage contained in the *Supplement* to the *Dictionary*, this figure probably remains about the same today.

First in importance of the methods used to keep the *Dictionary* up to date are the current field job analyses of occupations in essential industries. Job definitions are prepared from these data and related to definitions and classifications already contained in the *Dictionary of Occupational Titles* and its *Supplement*. Examples of recent studies of new industries resulting in significant additions of job definitions and classifications to the *Dictionary* are those for the synthetic rubber industry, and the production of alkalies in the chemical industry. Definitions resulting from these studies are contained in the *Dictionary Supplement*, Edition II, released February, 1944. Many similar studies have been incorporated in this new edition of the *Supplement*. After the war, all published supplementary data will be incorporated into one revised Second Edition to the *Dictionary of Occupational Titles*.

Examples of industries that are currently being studied are the plastics, electrical equipment, and the non-ferrous metal alloys and products industries. Additional studies are contemplated in the near future in other war and civilian industries essential to the economy.

Another method used to keep the *Dictionary* up to date is by means of special information compiled by public Employment Offices, reporting jobs apparently not covered by the *Dictionary of Occupational Titles*. As the employment interviewer encounters job seekers who describe new jobs, he records the information on special forms. These reports have proved to be valuable in gaining additional data on occupations. Similar reports from other users of the *Dictionary* would be of great benefit.

Still another source of information used to keep the *Dictionary* up to date are the numerous position descriptions, job descriptions, job definitions, job specifications, and other job information prepared by various organizations. As these materials are received, they are carefully analyzed and related to jobs in the existing system, and new definitions are written for jobs not covered. An example of a study now in progress by this method is a comparison of jobs in the iron and steel industry, as described in the volumes published by the American Iron and Steel Institute, with existing definitions in that industry defined in

the *Dictionary of Occupational Titles*. The results of many other studies will be incorporated in the *Dictionary* and its *Supplement*.

Aside from adding new information to the *Dictionary*, several specific changes are contemplated. Some changes may appear in the second edition, but others may not be developed until a third edition is published. In general these proposed changes may be grouped into two categories: changes in format and changes in content. In format it is hoped to improve the readability by new page set-up, more legible type, and simplified cross-reference techniques. As for content, an example of a probable change in the classification technique is the establishment of additional functionalized occupational groups, with a resultant reduction in the number and size of groups identified by industry or process. Other changes in content may be the expansion of the code structure, the addition of definitions for professional workers, and the improvement of techniques for reflecting job requirements in the definition. Whatever the final product, the ultimate goal for the *Dictionary* is total coverage of all jobs in the American economy presented in a form which will be most generally useful.

IV

Defining and Classifying "Entry" Fields of Work

Parts I and II of the *Dictionary of Occupational Titles* present a classification structure in terms of specific occupations. A large percentage of persons seeking work or vocational direction, however, are inexperienced or partially trained workers who cannot be classified in terms of specific occupations because they have never performed in them. These persons must be classified on the basis of their interests and potential ability to do or learn to do certain types of work. Many experienced workers also cannot properly be classified in terms of their customary occupations because changing circumstances make it undesirable or impossible for them to continue working at their previous jobs.

All these persons who cannot be classified in terms of specific occupations are called "entry applicants." They are, first of all, young people who have never had a job or who have worked only casually in summer or after-school jobs. They are older people who can no longer perform in their old jobs. They are persons whose jobs have been reengineered or eliminated because of changed economic conditions. They are job-seeking housewives who have never worked for wages or who have lost the industrial skills they once possessed. They are men discharged from the Armed Forces whose military experience does not convert readily to civilian occupations. Or they are the victims of war wounds and industrial accidents who must start new careers physically handicapped. For the guidance and placement of these groups the entry occupational classification structure, as presented in Part IV of the *Dictionary*, was developed.

Techniques of Entry Classification

Just as the *work experience* of the fully qualified worker is matched with the duties of *specific occupations* as defined in Part I of the *Dictionary*, so factors in the *past experience and background* of the entry applicant must be matched with the *types of work* defined in Part IV. The assignment of an entry classification requires an evaluation of all occupationally significant applicant characteristics. If cumulative school records and scores made on aptitude or achievement tests are available, the problem of classification is simplified. In the absence of such aids, classification must be based largely on data obtained from the

individual during the interview: casual work experiences, occupational interests, vocational training, hobbies and leisure-time activities, and all other indications of the individual's ability to do, or to learn to do, a given type of work.

All these interviewing factors must be carefully weighed and evaluated in classifying entry applicants. *Interests* must be examined to ascertain whether they are based on sufficient knowledge of fields of work and whether the individual's occupational capabilities support his interests. *Hobbies and leisure-time activities* must be carefully weighed for their occupational significance. *Personal traits* may be taken into account when they are suggestive of capacities, attitudes, and habits of work. *Training courses* must be evaluated to determine the length and content of the course, the reasons why the course was taken, the interest and profit with which it was pursued. When all this has been done, the pattern of factors emerges which represents the applicant's strongest combination of assets.

Development of Part IV

The first steps in the development of an entry occupational classification structure were taken in 1940. When Part II of the *Dictionary of Occupational Titles* was released, some pages were reserved for a section entitled, "Codes for the Temporary Registration of Youth and Others with Limited Work Histories."[1] These temporary registration codes were intended for supplementary use pending the release of Entry Occupational Codes and were designed for classifying entry applicants whose experience records were too limited to permit assignment of specific occupational codes. In June, 1941, the "Preliminary Edition" of Part IV of the *Dictionary* was published with the promise that an expanded classification would later be available. The Preliminary Edition presented a brief, basic entry classification structure. It provided 22 broad three-digit classifications for the coding of entry applicants, divided into the following six major fields of work:

Professional, Technical, and Managerial Work.
Clerical and Sales Work.
Service Work.
Agricultural, Fishing, and Forestry Work.
Mechanical Work.
Manual Work.

Basic occupational groupings in Part IV were made to correspond as closely as possible with those of Part II of the *Dictionary*, in order that a relatively uniform grouping of experienced and inexperienced applicants might be effected in the arrangement of applicant files. The principal divergence occurred in the substitution of two categories of "Mechanical Work" and "Manual Work" for the three categories of industrial skill, "Skilled." "Semiskilled," and "Unskilled" occupations, presented in Part II. Part IV obviously could not utilize these skill categories since entry applicants do not possess skills in such varying degrees. The Mechanical Work classifications, therefore, were designed to classify the "trade learners" or those entry applicants potentially able to perform the skilled and more exacting semiskilled types of work; and the Manual Work classifications were intended for those who possess qualifications suitable for entry into the unskilled and less exacting semiskilled types of occupations.

The 22 three-digit codes in the Preliminary Edition have titles such as Recording Work, Observational Work, and Manipulative Work. They are very broadly defined but experience has shown them to be practical for operating purposes. They form the basis of the more comprehensive entry classification structure now in process of development.

The Revised Edition of Part IV

To provide more discriminating entry classifications the broad three-digit classifications of the Preliminary Edition have been expanded. In June, 1942, *Preliminary Occupational Groupings for Use in Classifying Entry Applicants* was released. It consisted of relatively specific six-digit classifications for the reporting of war training courses and the classification of trainees from those courses. However, not all school training is as specific as the POG classifications imply. Some schools offer exploratory or orientation training which covers many fields of work. Others

[1] *Dictionary of Occupational Titles*, Part II, pp. 309–313.

offer preliminary training in special fields but the training itself is general and includes the operation of many machines or the performance of several operations. The expansion of Part IV, now in progress, does not materially alter the three-digit and six-digit classifications. Rather, it develops intermediate levels of classification to provide codes for the classification of broad interests and abilities, orientation, preliminary training, or specific vocational training and casual work experience.

These revisions in Part IV are presented in a Revised Edition which is being tried out experimentally in selected Employment Offices for validation in operating practice. The expanded entry classification structure provides an over-all picture of occupational relationships that will prove of value in relating vocational preparation and ability to actual employment opportunities. Interest in the Revised Edition has been expressed not only by placement officials but also by vocational counselors, educational administrators, and personnel workers in the military services, and in private industry.

The Revised Edition presents an expanding classification structure which records training and other classification factors in differing levels of preparation for each type of work. It is so constructed that each addition of a digit represents the next finer classification of required occupational characteristics. Definitions have been developed to show the field of work included by each classification at each level. The broader three- and four-digit levels are used to classify entry applicants with broad interests, certain indications of aptitude, and some types of preliminary training for broad fields of work. Classifications on the more specific five- and six-digit levels are given entry applicants with vocational training or casual experience in more specific types of work.[2]

Avenues for entry or transfer of skills from one line of work to another are also shown. Each classification at its finest level of breakdown presents a list of the "entry" occupations to which beginners have access and the "non-entry" occupations to which entry applicants can aspire by securing prerequisite training and experience. Each classification is also accompanied by a list of "Related Entry Classifications" to indicate other fields of work in which similar worker qualifications can be utilized. Part IV classifications thus reveal relationships between occupations and provide a composite picture of the world of work for entry applicants. Students themselves can profitably use Part IV in developing classifications for their own interests and abilities and in tracing these classifications through to specific types of entry occupations.

All the occupations in Part I of the *Dictionary* have not been related to Part IV classifications. Only those occupations of importance in converting to a war economy and back to a peace economy have been included, plus a sufficient sampling of other occupations to present a reasonably complete classification structure. The Revised Edition will, however, go a long way toward achieving the ultimate objectives of Part IV of the *Dictionary*.

Recent Accomplishments of Part IV

Part IV is being developed to make this part of the *Dictionary of Occupational Titles* of the greatest possible use to counselors, interviewers, and others who are interested in the vocational adjustment of youth and other entry applicants. To accomplish these objectives the Revised Edition does the following:

1. Presents an entry occupational classification structure which will meet the needs of entry applicants more fully. Entry applicants are persons in various stages of preparation for employment and their classification must take this fact into account. Part IV classifications at differing levels make it possible to code interests and abilities, orientation, preliminary training, specific vocational training, and casual work experience with codes that will credit specialized achievement and which will also reflect broader interests and abilities applicable to wide fields of work.
2. Relates these entry classifications to specific occupations and shows which occupations are "entry" for inexperienced applicants and which are "non-entry," requiring advanced training or experience.

[2] An effort has been made to make the code numbers themselves meaningful by attaching specific meanings to figures in various digit positions, with the result that, by memorizing these meanings, the significance of scores of classifications can immediately be recognized.

THE RANGE OF DICTIONARY CLASSIFICATIONS

This chart shows the range of occupational groupings for which classifications have been provided in the Dictionary of Occupational Titles and the type of data necessary for the assignment of each.

Kind of Classification	Classification Factors	Scope of Classifications
Part IV THREE-DIGIT CLASSIFICATIONS	Based on: 1. Broad interests 2. Potential abilities 3. Aptitudes 4. General educational background.	May be related to thousands of occupations grouped under such broad titles as Public Contact Work, Manipulative Work, Machine Trades, Crafts.
Part IV FOUR-DIGIT CLASSIFICATIONS	Based on all the factors listed above plus: 1. Special interests 2. Orientation 3. Preliminary training 4. Avocational activities.	May be related to several hundred occupations under such titles as Machining, Selling, Bench Crafts.
Part IV FIVE-DIGIT CLASSIFICATIONS	Based on all the factors listed above plus: 1. Specific interests 2. Vocational training 3. Shop performance 4. Casual work experience.	May be related to a hundred or more occupations under such titles as Welding, Electrical Repairing, Food Processing, Metal Machining.
Part IV SIX-DIGIT CLASSIFICATIONS	Based on all the factors listed above plus: 1. Specific vocational training 2. Limited work experience.	May be related to several occupations under such titles as Sheet Metal Work, Radio Repairing, Arc Welding, Metal Lathe Work.
Part I CLASSIFICATIONS	Based on: 1. Previous experience 2. Fully qualifying training 3. Ability to perform on the job as well as other experienced workers.	Usually defines just one occupation. Some classification or grouping titles, such as LABORER, may include several kinds of jobs.

3. Relates entry classifications to entry applicant characteristics. Grouped together in the Revised Edition as "Classification Factors," characteristics are analyzed briefly to show their value as indicators of entry classifications. Four groups of Classification Factors have been set up and related to entry classifications: (a) *Personal Traits*, such as dexterities, aptitudes, judgments, physical strength, and alertness. These traits provide a check on broad classifications which must be assigned to inexperienced, untrained applicants largely on the basis of interests, aptitudes, and other characteristics discovered in the interview. (b) *Leisure-Time Activities*, including hobbies. Consideration is given to the fact that the vocational value of such activities differs widely, depending upon the extent to which they have been pursued. (c) *Casual Work Experiences*. These are analyzed for their occupational significance in instances where entry applicants have worked successfully at part-time, juvenile, or other jobs in which they are no longer seeking employment but in which they have demonstrated abilities which might be useful in other lines of work. *Basic military training* is also treated as casual work experience. (d) *Specialized Training*, including Army, Navy, and civilian training. This supplies the entry relationships that are implied by each of the types of training mentioned.

Thus in a changing, shifting occupational scene such as exists today, Part IV attempts to show relationships between fields of work and entry possibilities for inexperienced persons. These relationships are designed as a vocational guidance and placement tool in the classification of (1) "junior" applicants just out of school, who have always constituted the bulk of entry applicants, (2) war workers who, as a result of training, may be recruited for jobs in war industries for which they are not fully qualified according to Part I, (3) war workers who after the war must be reemployed in peacetime occupations in which their war training or experience may have some value but for which they cannot be given a specific Part I code without placing limitations on their chances for employment, (4) disabled veterans who must find work in new fields in which they have not had training or experience, and (5) veterans with specialized military training or experience which does not readily convert to occupations as defined in Part I.

The Revised Edition of Part IV presents a greatly expanded entry classification structure but even the Preliminary Edition, limited as it is in scope, has proved very helpful in classifying entry applicants. It has been used extensively by Employment Offices in the classification and selection of inexperienced workers for war jobs. The Army has used it to classify students and candidates for training. The Navy has made adaptations of it for the preliminary screening of inexperienced enlisted men selected for specialized training. Schools and colleges use it as a guidance and placement tool. In terms of specific numbers, more than 25,000 copies of Part IV are in use today and it is expected that the expanded Part IV will play an even more important role in the reconversion to peacetime activity.

V

Establishing Families of Occupations

In 1935 the study of occupational relationships to determine "job equivalents" or "families" of jobs was introduced into the Program of the Division of Occupational Analysis and Manning Tables. The Technical Board of the Division held discussions on the need for data to assist in transferring workers from job to job with the fullest possible use of previous skills. Technological changes in industry were making some jobs obsolete. Workers were being forced by conditions in industry and business to change their vocational field. Physically handicapped workers had been sadly neglected in the field of employment and their vocational guidance might be facilitated by information on job relationships, particularly if that information were in terms of worker traits required.

A member of the Technical Board, Morris Viteles of the University of Pennsylvania, had developed the "job psychograph"[1] and demonstrated its value in job and worker evaluation through ratings of specified worker traits. Some work had been done on the comparison of job requirements through testing procedures. However, the measurement of job similarities by testing would be a slow and expensive program. Investigation of job similarities was needed urgently for a wide range of occupations. For that reason the Division adopted the method used by Dr. Viteles and initiated the analysis of occupational characteristics to be used in developing families of jobs.

Worker Characteristics

Therefore, in 1935, an "Occupational Characteristics Check List" was added to the job analysis schedule. This list consisted of numerous worker traits such as finger dexterity, eye-hand coordination, and strength of back. The analyst in the field was instructed to rate each item on the Check List according to five levels of significance: "negligible," "barely significant," "significant," "important," and "of utmost importance."

Revisions in this Check List were made from time to time on the basis of experience. The worker characteristics were reduced to 48; three levels of rating (A, B, and C, defined in terms the amount possessed by various percentages of the population) were decided upon, and the name of the list was changed to "Worker Characteristics Form."[2]

This form is used in rating each job which the analyst observes and for which a Job Analysis Schedule is prepared. The estimates of several analysts who have observed the same job in different plants can be compared and used in arriving at a relatively reliable rating. These estimates of characteristics requirements of jobs form the basis for the comparison and evaluation of jobs to determine roughly what similarities exist in terms of the workers.

Speed Sort Card

For two years the collection of data constituted the major portion of the job family study. In 1937 the Division became concerned with the problems involved in processing the data on worker traits and comparing these data to determine job relationships. Recording the data on Speed Sort cards was tried as an experiment. By this means the cards could be sorted for comparison of patterns of worker characteristics. These methods were later adopted as standard procedure.

The Speed Sort card included all the pertinent information from the job analysis. Since each Speed Sort card was meant to represent an occupation, not a specific job in a given plant, the first step in preparing the data for entry on the card involved the qualitative analysis of all ratings by the various analysts for the same occupation, in order to arrive at a final rating for the occupation. A Master Worker Characteristics Sheet was prepared

[1] Morris S. Viteles, *Industrial Psychology* (New York: W. W. Norton and Company, 1932).

[2] Stead, Shartle, and Associates, *Occupational Counseling Techniques*, (New York: American Book Company, 1940).

for each occupation, and contained the final ratings of worker characteristics as well as pertinent information on duties performed, tools, equipment and materials, and education and experience requirements obtained from the schedules. Data were transferred to the Speed Sort card from the Master Form, partly in coded and punched form, and partly in written form on the face and back of the cards. The resulting cards could then be sorted with a hand needle to separate them according to job and worker characteristics, singly or in combination.

Preliminary Job Comparisons

Once the Speed Sort card procedure was adopted, the sample of occupations for the study of job relationships grew constantly. At first the studies done from the Speed Sort cards were in terms of worker characteristics alone. Jobs were compared to discover which required the same or similar patterns of worker traits. Between 1937 and 1939 several experiments in such comparisons were made.[3] Certain arbitrary traits were chosen and all occupations in the sample were reviewed to select those which required that particular group of traits. In other studies, the patterns of traits for occupations in different industries were compared. In addition, all occupations in the sample in which, for example, machines were used, were compared on the basis of the various worker characteristics with those in which no machines were used.

At the present writing approximately 9,000 occupations from 85 industries have been catalogued on Speed Sort cards. A tabulation showing the frequency of occurrence of each trait has provided material for many comparisons of job requirements. For example, a study of education requirements shows that 58 per cent of the sample of occupations require no formal education, 13 per cent of the sample of occupations require "little" education, 13 per cent require a grammar school minimum, 11 per cent a high school minimum, and 1 per cent a college minimum. Howard Bell in his book, *Matching Youth and Jobs*, used these data.[4]

Other job requirements show that 53 per cent of the jobs involve the use of machines, 47 per cent require fine accuracy, 32 per cent are repetitive, only 2 per cent require a pleasing personality, and 1 per cent specify height; 41 per cent of the skilled workers must possess a memory for detail as contrasted with 2 per cent of the unskilled; 32 per cent of the skilled workers must possess strength of hands as compared with 22 per cent of the unskilled; 17 per cent of the skilled must possess strength of back as opposed to 34 per cent of the unskilled; 57 per cent of the skilled must possess dexterity of hands and arms as opposed to 17 per cent of the unskilled; 59 per cent of the skilled must possess eye-hand coordination as opposed to 15 per cent of the unskilled.

Occupational Job Families

The defense emergency in 1940 brought to light the fact that there were a number of "critical" occupations in which there were shortages of fully trained and experienced workers. Tools were urgently needed to aid in selecting related workers who could be rapidly trained for these occupations. Job Families met this need. The first family developed was the Job Family for Precision-Lens Grinder, distributed to Employment Service offices in January, 1941.

Other families have been published in the currently active "Occupational Series." The Speed Sort cards facilitated the discovery of relationships but had to be supplemented. A specific job with its pattern of estimated worker requirements and its set of duties, tools, machines, and other requirements formed the basis for the family. The multiple occurrence of both worker and job characteristics in the highly complex "critical" jobs led to the establishment of a procedure for grouping these requirements under four major categories: (1) work done, (2) tools, machines and other work aids used, (3) materials used, and (4) significant worker characteristics required.

In addition, a system was developed for weighting each of the requirements of a job on the basis of level of skill involved, training time consumed by that part of the job, percentage of time spent on that part of the job, or any appropriate combination of these

[3] Idem.

[4] Howard M. Bell, *Matching Youth and Jobs* (Washington, D. C.: American *Council on Education*, p. 261).

bases. This system was carried a step further by establishing a method for setting a "minimum pattern for matching;" in other words, selecting a group of factors which must be found in all jobs in the family, with the understanding that jobs which did not meet the minimum pattern were of such remote relationship as to be unimportant to the job transfer problems of the Employment Service offices.

Another aid to the development of Job Families was the setting of standards and procedures by which the degrees of relationship among jobs selected could be roughly outlined and used in listing the related jobs. These degrees give meaning to lists of related jobs which frequently total more than 200. The first group of jobs is estimated to be most closely related—workers with experience in those jobs could probably be transferred to the base job of the family with little or no retraining. The next group of jobs is less closely related but is supplied to meet the contingency that no workers with experience in the jobs of the first group are available at a given time in a given locality. The last group of jobs barely meets the minimum requirements for useful similarity but is listed for possible assistance in the selection of trainees who, though they may need full training, may be more likely to succeed in learning the job than persons selected at random. (*See* Figure 1.)

Military Job Families

Another problem in the transfer of workers naturally developed with the establishment of Selective Service in the fall of 1940. Men with useful civilian experience were being drafted into the Armed Forces and the adequate use of their skills in the Army, Navy, Marine Corps, and Coast Guard required that those civilian skills be related to military jobs. In response to requests from the Army, the job family technique was used in preparing releases on many purely military jobs such as Aerial Gunner and Bombardier. The Job Families for civilian jobs were also applicable to the problem of conversion to military work when the military job was fairly comparable to some civilian work.

Industrial Job Families

Another application of the technique came in August, 1941, one year after the beginning of a concentrated program of job family study. The stepped-up defense production program resulted in the wholesale conversion of industry. However, the shortage of silk was responsible for the first release in the new group of job families. The country expected silk hosiery and textile mills to shut down completely. Many of them did, or closed temporarily to allow time for conversion. Experienced workers in all the occupations in these two industries were thrown on the labor market and needed to be transferred as quickly as possible to other work.

This situation produced the first "Industrial" Job Family. Each occupation in the industry is treated in an Industrial Job Family, and abbreviated groups of related jobs in other industries are listed for each occupation. The work already accomplished in developing the Occupational Job Families provided excellent reference material for developing Industrial Job Families with utmost speed. Industries such as jewelry manufacturing, automobile manufacturing, refrigerator manufacturing, silverware, metal furniture, and aluminumware manufacturing were the next subjects for Industrial Job Family releases, as the War Production Board instituted curtailments of metal for consumer goods and more plants closed or converted to defense production.

Job Family Uses

The releases prepared in the Occupational and Industrial Job Family Series during this period were generally for distribution to Employment Service offices or for special use by the Armed Services in classification and assignment work. Soon specific plants converting to war production needed assistance in providing for the occupational adjustment of their workers. They found Job Families useful in transferring their own peacetime workers to related jobs created by a new production plan; and, as the labor market grew tighter, in upgrading and transferring workers within the plant to assure full utilization of workers' skills. As manpower utilization

COMPOSITION ANALYSIS OF JOB FAMILY FOR AIRPLANE WOODWORKER

NO DIFFERENCE — DIFFERENCE IN DEGREE — DIFFERENCE IN KIND — DIFFERENCE IN KIND AND DEGREE — ABSENCE OF FACTOR

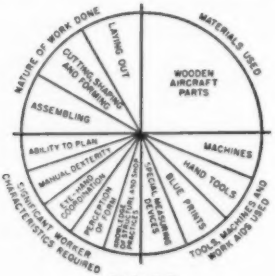
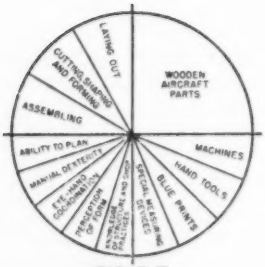


TABLE I



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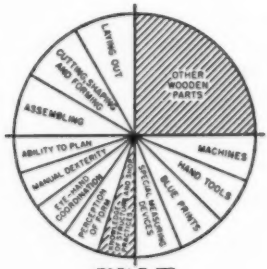

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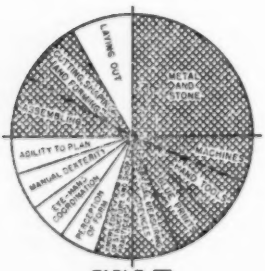

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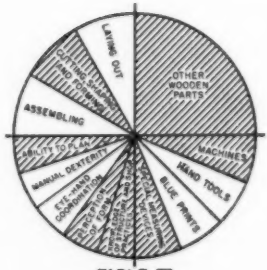

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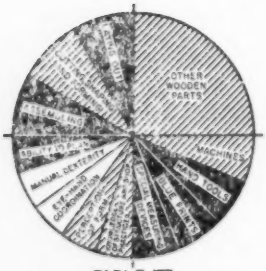

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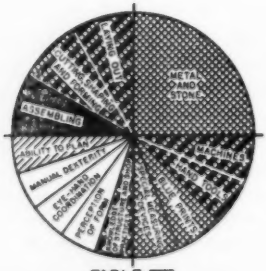

TABLE VII

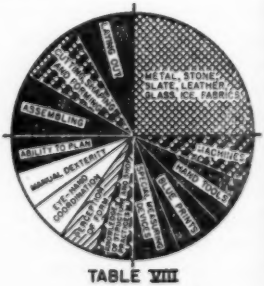

TABLE VIII

FIGURE 1

became a significant weapon of war production, the job family facilitated the other type of "upgrading"—the discovery of persons who were incorrectly placed when they came into the plant but whose previous experience could be used to advantage. The Job Families have been instrumental in indicating how apparently unrelated experiences could be applied in war production jobs. Familiarity with Job Families and with the theory and practice of occupational relationships led several large companies to institute personnel inventories to search out hidden skills.

Seventy-eight Job Families in the Occupational Series have been published to date, 52 in the Industrial Series, and 21 in the Army Series. In addition, 924 Job Families have been prepared for use in meeting specific problems.

Job Families give vocational counselors in schools a concept of job relationships and worker characteristics that is valuable in planning curricula to meet the individual needs of the students and that is also helpful in counseling workers lacking traits that are significant in a chosen job. Job Families indicate that a wide variety of jobs may be available for a single individual and that training can prepare him to take, not one, but many jobs within a field of work.

Data on job relationships and the possible carry-over of skills and abilities from one job to another are necessary to sound occupational adjustment by adult workers. Similar data are needed for the effective guidance of young people training for a chosen field of work so that they may understand the full range of employment possibilities during the period of preparation. Job Families have also played a part in aiding the vocational adjustment of the physically handicapped. A series of releases suggests possibilities for the employment of persons with certain handicaps in jobs related to those which they formerly held but could no longer follow because of the handicap.

Job Families were included in the Special Aids for the Placement of Military Personnel in Civilian Jobs. Navy and Army enlisted classifications were studied and suggestions were made as to related civilian jobs which might utilize military training and experience.

The surge of housewives into the war labor market led to the use of the job family technique in outlining war jobs most closely related to tasks the housewife performs and to the abilities and traits associated with the performance of such tasks. The selection of trainees from among specific segments of unemployed workers also provided a use for the technique. For example, in New England a large number of jewelry workers were unemployed and trainee weavers were needed. It was not feasible to use an aptitude-test battery for selecting these trainees from the group at hand, and a Job Family, indicating the jewelry occupations which had patterns of worker characteristics most similar to the weaving occupation, was used instead. A similar device was set up for the selection of trainees to learn various jobs in shell manufacturing from among workers with previous experience in such industries as canning, confectionery, textile, garment, and furniture manufacturing.

Job Family information has at times been used by war production firms in selecting contracts for war products. The conversion of an employed labor force to an entirely new set of jobs can be as expensive and time-consuming as the conversion of machines and plant lay-out. Job Families have been used to select product manufacturing in which jobs closely related to present jobs in the plant are needed, thus providing for rapid retraining and occupational adjustment of workers already on the pay-roll.

Summary

Research in occupational relationships has resulted in the establishment of the following standards for use in research:

1. The establishment of four categories of requirements on the basis of which occupations should be compared, namely:
   (1) Nature of work done
   (2) Tools, machines, and other aids
   (3) Materials
   (4) Traits required of the worker

These four categories allow for flexibility in the types of comparisons made to meet specific transfers.

2. The development of a classification scheme in which occupations may be coded

and compared according to "nature of work done." The classification is so arranged that codes for "work done" fall into broad groups of fields of work, somewhat narrower "process" groups, and finally into numerical relationship to each other. Definitions for each "work done" classification have been set up.

3. Establishment of a numerical weighting device which can be applied to the job and worker requirements of occupations in order to determine consistently the degree of relationship between jobs. The weights have been determined on the basis of a comprehensive analysis of the job elements and worker traits associated with the various levels of skill found in the occupational picture.

That the theory upon which job relationships are established is sound, is indicated by the following results:

1. Verification of the premise that occupational relationships so established would expedite the transfer of workers.
2. Preliminary validation of a rating device which provides a pattern of traits required by jobs. Continued use of the ratings of traits has shown that such ratings can be used for job comparison with dependable results.

Future Needs

The reabsorption of veterans and the shift of civilians from wartime production will be a stupendous task of worker transfer, retraining, and reallocation. Job families prepared for application to problems of conversion to war will be equally useful in the reverse situation.

Information on occupational relationships is being used now more than ever in *planning* for shifts of workers, as well as for executing the plans. Occupational groupings for entire industries have evolved from the study of occupational relationships and these are now being applied in experimental work in the development of "Industrial Mobility Patterns"—the comparison of groupings as they occur in present employment and as they are expected to occur in the post-war economy. Figures of total employment are more meaningful in both national and local planning if they can be shown for categories representing homogeneous occupational groups on the basis of worker skills and abilities. Cooperative work has been undertaken with other government agencies to develop patterns of occupational skills for industries, to break down an estimate of "so many workers in shipbuilding" to "so many workers with various types of skills in shipbuilding." From that point, comparison may be made with other industries to furnish information as to where and to what extent similar skill-groups may be needed and usable in peacetime activities.

The preparation of conversion materials for the military and for war industries has been an ever-increasing aspect of job family work. The procedures for relating jobs in war production have been practically completed although work is continuing on such aspects as upgrading studies. The questions of interest today are: What next will cause workers to shift from one job to another; what new industries will be growing up after the war to demand new types of skills; what industries will die out and leave workers to take up new vocations; how should vocational training be effected in the post-war era to prepare workers for broader applications of the training they received?

VI

Determining The Physical Demands of Jobs

PHYSICAL DEMANDS ANALYSIS and *Physical Capacities Appraisal* provide a technique which helps answer the question, "What can you do on the basis of your physical abilities?" In the United States Employment Service this information is particularly pertinent when providing adequate vocational rehabilitation for disabled war veterans, as well as when meeting demands of a stringent labor market which requires the employment of physically handicapped workers or others whose physical abilities must be taken into account. Secondary schools and colleges will also find the techniques and information a valuable supplement to a vocational guidance program. Remmers and Gage[1] have stressed this point: "Teachers can introduce a distinctly realistic note into their occupational counseling of pupils by calling attention to the physical requirements for occupations and relating the pupil's own physical status to them."

Physical Demands Analysis consists of using a prescribed form to make a comprehensive record of job requirements in terms of physical activities, working conditions, and hazards to which a worker is exposed. A completed form for the occupation of Shipwright is shown in Figure 2.

Physical Capacities Appraisal consists of using a prescribed form to make a comprehensive evaluation of a worker's physical abilities in terms of the degree to which he can perform specified physical activities and can withstand specified working conditions. A sample of a completed form is shown in Figure 3. The combination of these two forms provides a technique, using a common terminology, to indicate *what the job requires* as well as *what a person can do* so that both specifications may be matched to obtain the most effective use of a worker's physical abilities on the job.

[1] H. H. Remmers and N. L. Gage, *Educational Measurement and Evaluation* (New York: Harper's, 1943).

DEVELOPMENTAL HISTORY

Research in *Physical Demands Analysis* began in the Division of Occupational Analysis and Manning Tables in 1936,[2] in connection with job analysis for the placement of the physically handicapped. The original form combined a rating of twenty-one physical activities and thirteen working conditions with an additional statement on the details of each. Various adaptations of this format were used until 1943 when the form shown in Figure 2 was introduced as standard for job analysis work as well as for the United States Employment Service program for the "selective placement" of the handicapped. The present procedures use a specific analysis record form, with a written description which provides a narrative pattern of a job's physical requirements. With the exception of the "Special Aids" described under "Related Activities," the use of a rating procedure for preparing physical demands analysis was discontinued in June, 1943. The rating procedure depended upon a subjective estimate which had been found to be unreliable. Furthermore, the procedure meant little to anyone interpreting the ratings, since time and intensity were combined. The present procedures prescribe the use of specific objective data in terms of the time factor as well as the intensity factor, on each physical activity and working condition. Whereas in the use of the rating procedure, "lifting" for the occupation of Pipe Fitter would be rated as "moderate," the present method provides information on what was lifted, the distance lifted, the weight, the distance carried, and the time required of the worker in this activity.

There have also been some additions and a broadening of the scope for using the tech-

[2] K. Vernon Banta, then supervisor of the St. Paul, Minnesota Occupational Studies Center, initiated the use of *Physical Demands Analysis* and has led in its development and introduction in Employment Service Operations.

WAR MANPOWER COMMISSION

BUREAU OF MANPOWER UTILIZATION

DIVISION OF OCCUPATIONAL ANALYSIS AND MANNING TABLES

PHYSICAL DEMANDS FORM

Job Title SHIPWRIGHT Occupational Code 5-25.640

Dictionary Title CARPENTER, SHIP

Firm Name & Address

Industry Ship and Boat Bldg. and Repair Industrial Code 3431

Branch Cargo Vessel Department Hull Erection

Company Officer W. Jones Analyst J. Smith Date 1-10-44

PHYSICAL ACTIVITIES			
X	1 Walking		16 Throwing
	2 Jumping	X	17 Pushing
	3 Running	X	18 Pulling
	4 Balancing	X	19 Handling
X	5 Climbing		20 Fingering
	6 Crawling		21 Feeling
X	7 Standing	X	22 Talking
X	8 Turning	X	23 Hearing
X	9 Stooping	X	24 Seeing
X	10 Crouching		25 Color Vision
X	11 Kneeling		26 Depth Perception
	12 Sitting		27 Working Speed
X	13 Reaching		28
X	14 Lifting		29
X	15 Carrying		30

WORKING CONDITIONS			
X	51 Inside	X	66 Mechanical Hazards
X	52 Outside	X	67 Moving Objects
X	53 Hot	X	68 Cramped Quarters
X	54 Cold		69 High Places
	55 Sudden Temp. Changes		70 Exposure to Burns
	56 Humid		71 Electrical Hazards
	57 Dry		72 Explosives
	58 Wet	X	73 Radiant Energy
	59 Dusty	X	74 Toxic Conditions
	60 Dirty	X	75 Working With Others
X	61 Odors	X	76 Working Around Others
X	62 Noisy		77 Working Alone
X	63 Adequate Lighting	X	78 Day Shift
X	64 Adequate Ventilation		79
	65 Vibration		80

DETAILS OF PHYSICAL ACTIVITIES: Climbs approximately 60 steps to and from basin bottom twice daily. Walks and stands (3 hours), kneels, stoops, crouches, and turns (3½ hours) in carpentering operations. Using both arms and hands, crouches, reaches for, grasps, lifts, and carries shoring material (up to 150 lbs.) approximately 20 ft. (½ hour). Using both arms and hands, reaches above and below shoulder level to grasp, push, and pull shoring into place, and to operate a jack (exerting a force up to 150 lbs.) (1 hour). Using either or both arms and hands, handles and manipulates sledge hammer (8 lbs.), carpenters tools, broad-ax, and adz (6½ hours). Reads steel rule calibrations of 1/16 inch. Receives oral instructions and discusses work with others.

DETAILS OF WORKING CONDITIONS: Works with others inside and outside ship compartments and outside in basin (8 hours). Works in cramped quarters as low as 4 feet (2 hours). Floor may have hose and building materials on it.

DETAILS OF HAZARDS: Exposed to ultra-violet and infra-red radiations from welding arcs (2 hours); to moving materials carried by overhead cranes; to noise from nearby chipping and hammering (6 hours); and to slightly toxic fumes from welding (2 hours).

NOTE: Time in hours indicates approximate time per day during which the physical demand is pertinent.

FIGURE 2

WAR MANPOWER COMMISSION

BUREAU OF MANPOWER UTILIZATION

Division of Occupational Analysis and Manning Tables

PHYSICAL CAPACITIES APPRAISAL FORM

Name X Age 28 Sex M Height 68 Weight 130

PHYSICAL ACTIVITIES			
1	Walking	✓ 16	Throwing
2	Jumping	✓ 17	Pushing
3	Running	✓ 18	Pulling
4	Balancing	✓ 19	Handling
✓ 5	Climbing	✓ 20	Fingering
✓ 6	Crawling	✓ 21	Feeling
7	Standing	22	Talking
8	Turning	23	Hearing
9	Stooping	24	Seeing
10	Crouching	25	Color Vision
11	Kneeling	26	Depth Perception
12	Sitting	27	Working Speed
✓ 13	Reaching	28	
✓ 14	Lifting	29	
✓ 15	Carrying	30	

WORKING CONDITIONS			
51	Inside	66	Mechanical Hazards
52	Outside	67	Moving Objects
53	Hot	68	Cramped Quarters
54	Cold	69	High Places
55	Sudden Temp. Changes	70	Exposure to Burns
56	Humid	71	Electrical Hazards
57	Dry	72	Explosives
58	Wet	73	Radiant Energy
59	Dusty	74	Toxic Conditions
60	Dirty	75	Working With Others
61	Odors	76	Working Around Others
62	Noisy	77	Working Alone
63	Adequate Lighting	78	
64	Adequate Ventilation	79	
65	Vibration	80	

DETAILS OF PHYSICAL ACTIVITIES: Blank Space = Full Capacity; ✓ = Partial Capacity; I = No Capacity

May lift, carry, handle, push or pull up to 35 pounds 6 times per hour

May engage in activities numbered _____ up to 2/3 of work period

May engage in activities numbered _____ up to 1/3 of work period

Sight: _____

Hearing: _____

Others: Can work with right arm only.
No climbing where both arms are needed.

DETAILS OF WORKING CONDITIONS:

DIAGNOSIS:

Flail left arm, residuum poliomyelitis contracted July 1943.

Underweight.

Date April 1 194 4 Physician Z

FIGURE 3

niques developed. The most significant addition has been the introduction of *Physical Capacities Appraisal*, using the form in Figure 3 which complements the form for *Physical Demands Analysis* when making a "selective placement." The Physical Capacities Appraisal form is an outgrowth of Physical Demands Analysis, since it was realized that in matching individuals with jobs, it was necessary to consider the same items in appraising an individual's physical capacities as those used in analyzing the physical demands of jobs. In 1943, the scope for the use of the techniques was expanded as an aid in the utilization of women, older workers, and others who must be given consideration because of their physical limitations.

Underlying Philosophy

The development and use of the technique is based on the thesis that there are individual differences among workers in their physical capacities and that there are differences among jobs in their physical demands. Each worker is considered to have an individual pattern of specific capacities for the physical activities and working conditions which may be found in jobs. If all workers were rated on capacity for walking, the range in capacity would extend from those who were bedridden and could not walk at all to those who were most able-bodied and could walk many miles per day. The distribution of this capacity would probably follow the contour of a normal curve. Similarly workers vary in the ability to see. There are those who are totally blind, who have traveling vision, who are industrially blind, who are near-sighted, or far-sighted, and who have exceedingly good vision. Workers' capacities vary for each physical demand such as to lift, to manipulate fingers, to work with oily materials, to work in noisy surroundings, and to work in very hot air. These differences in physical capacities may be inherent or result from environment; they may have been caused by industrial and other accidents, by industrial or other disease, by warfare, or they may be influenced by age.

Individual differences are recognized which place workers in a specific category, such as persons who are blind, deaf, or who have orthopedic disabilities and cannot walk or lift or bend. Workers with an unusual physical limitation will show as much, if not more, variation among themselves on other physical capacities, as will be found among the physically fit. For example, workers who cannot see will vary considerably in their finger dexterity and sensitiveness in perceiving through touch; and workers who have lost the use of their legs will vary considerably in their ability to reach and pull with their arms. These differences among workers having the same unusual physical limitation may be a result of any one or a combination of two or more of the following factors: inherited characteristics, or differences in home environment, avocational opportunities, work experience, or education. There are other influencing factors, such as (1) the degree to which a worker, on his own initiative, has been able to overcome the handicaps of an unusual physical limitation by making an adjustment to it and by developing compensating physical abilities for it; (2) the extent to which specific training has resulted in overcoming or compensating for the physical limitation; and (3) the effectiveness of prosthesis development and use. Some workers will not use prosthetic aids and others will be able not only to compensate fully for the loss of a hand or foot but will have more capacity for some activities than a person without such a disability.

Just as there are individual differences among people, there are also great differences in the physical activities and working conditions which comprise the physical demands of jobs. Some jobs require a great output of energy because of lifting and carrying heavy equipment for long periods of time; some enable the worker to sit at a bench and require the use of only one arm and hand in reaching, handling, and fingering to assemble small parts. Each job has its own specific pattern of physical demands which necessitates that it be considered independent of other jobs. The same job may be different in each of two or more establishments because of different production methods, different products, different working conditions, and different building construction. In addition, there are frequent changes in job duties which result

in changes in the physical demands of the work. Jobs, then, must be considered independently for each establishment at a specific date.

Having an identification of the physical demands of jobs with an appraisal of a worker's physical capacities, the next step is to match the two for the most satisfactory occupational adjustment of the worker. This effective matching is facilitated by the use of the technique of *Physical Demands Analysis* and *Physical Capacities Appraisal* since it provides specific, objective, occupational information and uses a common terminology for both the analysis and appraisal, which enables each potential worker to be considered as an individual having a specific degree of capacity for each physical activity, working condition, and hazard of the job.

When matching the degree with which a worker's capacities can qualify him for satisfactory performance in a job, it is necessary to appraise a worker's capacity not only in terms of positive attributes, but also in terms of limitations in a specific physical ability which, although often a reason for rejection on many jobs, may actually be an asset for others. For example, many industries have found that deaf workers are very satisfactory on jobs where the working conditions are exceedingly noisy.

This technique is useful in occupational counseling concerned with vocational choice and training, as well as for occupational adjustment from one job to another, inasmuch as the physical capacities of individuals are directly related to their vocational fitness.

Use of Technique

The *Physical Demands Analysis* and *Physical Capacities Appraisal* technique is used in United States Employment Service offices in the registration and referral of applicants who are given "selective placement" because of physical limitations.

Employers have become interested in this method of matching jobs and workers and request assistance in introducing it into their own personnel work. In these instances, occupational analysts assist members of the employer's staff in making the analyses and using the appraisal forms. A comprehensive "selective placement" program within a specific establishment provides basic data to facilitate the efficient operation of procedures for allocating new employees to jobs they are physically qualified to handle, especially for those workers who must be given special consideration because of physical limitations; for transferring a worker from one job to another job within the establishment, whenever it has been found that he had been inaccurately placed before the "selective placement" program was put into operation; for hiring veterans; and for giving the best opportunities to workers injured on the job.

Programs similar to the one outlined for employer establishments have been made available to non-profit vocational guidance and placement organizations and associations. The first of these was developed with the cooperation of the National Tuberculosis Association.

Physical Demands Analyses of jobs may be made in connection with preparing job analyses, job evaluation studies, motion-time analyses, or job specifications. This information may be used to identify jobs which a potential worker would be physically qualified to handle; to supplement general occupational information about jobs; to modify job specifications in establishments where the physical qualifications were high and where the same standards had been used for all jobs regardless of what the job required in terms of specific physical demands; to point up the time and intensity factors of a job so that the energy output of the worker may be estimated for consideration as a factor in job evaluation for the establishment of wages; to enable a careful breakdown of the physical requirements of a job so that reengineering may reduce the energy-consuming physical activities or improve working conditions, or install safety devices for protection against unusual occupational hazards; and to determine the nature of the physical demands of jobs which had been held by a disabled worker before he had any unusual physical limitations.

Physical demands analyses may be useful to:

1. Educators in courses of study in occupational information.

2. Industrial engineers when analyzing jobs.
3. Counselors in schools, in industry, or in government when matching medical reports on a person's physical capacities with the physical demands of jobs in which he is interested.
4. Personnel interviewers in industry or in the United States Employment Service when making a "selective placement."
5. Physicians when examining a worker with regard to his physical capacities for the specific physical demands of the job the worker was hired to fill, or for the job to which the worker is being transferred because of an accident which has changed his physical capacities for some of the items considered in the physical demands analysis.
6. Vocational rehabilitation specialists who must provide their clients with facts as to job demands upon their strength, endurance, and dexterity.

In the Division of Occupational Analysis and Manning Tables, physical demands analyses are made by Occupational Analysts as a part of a composite job analysis or as a special study in specified establishments. Information obtained from physical demands analyses is immediately made available to local Employment Service offices handling the employment of workers for the companies wherein the analyses were made. Copies of completed forms are also forwarded to Washington, D. C., headquarters of the Division of Occupational Analysis and Manning Tables, from which general physical demands information is supplied to Employment Service offices throughout the nation. In addition, physical demands information is included in Job Descriptions for specific occupations and in manuals for the use of Aptitude Test Batteries. Employment Service interviewers engaged in the "selective placement" of workers having unusual physical limitations, prepare physical demands analyses for specific job openings. Other Employment Service personnel may also secure physical demands information when preparing job order specifications.

A *Physical Capacities Appraisal* of a worker is usually made by physicians. A medical doctor in a hospital, sanatorium or clinic, or a personal physician may make the appraisal upon request of the Employment Service, an employer, the worker, or as a part of a regular procedure whenever a person is discharged after being confined. The industrial physician may prepare an appraisal as an integral part of the pre-employment physical examination. His appraisal is also used when a decision is being reached on replacing an injured worker on his job or transferring him. A *Physical Capacities Appraisal* may be made in terms of the limitations which should be considered for placement either now or in the future.

Results

The technique of matching physical demands information of jobs with the physical capacities appraisal of the individual makes it possible to achieve the following results:

1. Objectivity in the utilization of workers according to their physical abilities.
2. Improvement in employment opportunities for older workers, since workers are assigned to energy-consuming jobs in accordance with the capacity of each for endurance and stamina without regard to age.
3. Reduction of emphasis on the sex of workers, since individual capacities are the criteria.
4. Making the pre-employment physical examination a means of properly allocating a worker to a job in accordance with his specific physical abilities, rather than expressing the results of a physical examination in general terms of acceptance or rejection.
5. Providing a common language for industrial personnel technicians, physicians, counselors, and workers in public and private agencies.
6. Identification of job requirements in terms of physical activities which may be used as a basis for training disabled workers.
7. Specialization in the selection of prosthesis to enable maximum satisfaction in a specific job.
8. Preventing an aggravation of an earlier condition brought about by placement or transfer to work which was unsuitable for the worker.
9. Facilitating the occupational adjustment to civilian pursuits of disabled military personnel.

10. Reduction of absenteeism and turnover.

Related Activities

In 1942, the Division prepared procedures for making a rating of physical demands and a study was completed on the development of "Special Aids" to facilitate the placement of Navy personnel in civilian jobs. A similar study was made for military occupational specialist classifications in the U. S. Army, and a study is in progress for commissioned officer classifications. To rate physical demands the analyst had to estimate the amount of each physical activity and working condition involved in the job. The rating included both the time factor and intensity factor and was expressed in categories of "little," "moderate," and "great." The format of the "Special Aids" is shown in Figure 4.

Each has the military job title; a job summary for the military job; groups of civilian occupations which are related to the military job; general statements indicating the training needed to supplement military experience to qualify for placement in one of the related civilian occupations; and estimates of the most important physical demands in most of the related civilian occupations in each group. This information is not meant to be conclusive when determining the suitability of a job and is used only as a rough guide to indicate the major physical requirements.

In 1941 the Division of Occupational Analysis and Manning Tables initiated a study to prepare lists of jobs which could be considered suitable for workers having unusual physical limitations such as blindness or deafness, or having inactive tuberculosis or orthopedic disabilities. Seventeen bulletins were prepared for occupations in industries selected on the basis of essential importance.

1. Four bulletins used Job Family procedures. For example, tables of related jobs were prepared for the occupation of Arc Welder, which was considered suitable for the employment of workers with one fully functional hand and with adequate prosthesis for the other hand. The tables contained related jobs which required knowledge and skill similar to the job of Arc Welder, but needed no more than a limited degree of strength and movement of hands and arms.

2. Two bulletins contained lists of jobs suitable for the blind. Occupations in which the worker feeds an automatic machine in a simple routine manner or occupations involving simple assembly tasks were listed.

3. Eleven bulletins listed jobs suitable for workers having disabilities in any of eleven categories. Each job was selected by comparing the average limitations a specific disability imposes upon a person with the typical physical demands of jobs. These lists of jobs were prepared only as suggestions of the types of work in which workers with disabilities might be successfully placed.

The preparation of lists of jobs suitable for the employment of workers having unusual physical limitations was discontinued in 1943 because such a list (1) emphasizes a worker's limitations, which leads to his being classified according to his disability instead of pointing up his physical abilities which may be used in many jobs; (2) assumes that all individuals having a specific disability, such as one hand, are incapacitated to the same degree, whereas individual differences among such a group would vary widely; (3) tends to limit work opportunities by identifying workers with a specific list of jobs instead of providing information which would enable an individual worker's physical qualifications to be matched with any job for which there may be an opening; (4) assumes that jobs having the same job title have a similar pattern of physical demands whereas these vary with different plants.

The lists of jobs considered suitable for the employment of workers having unusual physical limitations were succeeded by reports based solely on jobs which have been successfully held by such workers. Studies on supplemental information to these reports have been initiated in order to secure more detailed facts on steps followed in the "selective placement" process of making an appraisal of each worker's physical capacities, selecting the job, placing the worker in it, and following up on job success and job satisfaction.

Bulletins have been prepared consisting of a bibliography of references and a list of avail-

INSTRUMENT LANDING EQUIPMENT REPAIRMAN Army Spec. Ser. No. 933

DUTIES:

Constructing and Repairing: Constructs, maintains, and repairs antennae array instrument finding equipment and its power supply equipment.

Operating: May operate this equipment in absence of operator.

Other Duties: Must be a graduate of a Radio-Mechanic Technical Training Command School, and have completed an additional course in antennae array construction and maintenance. Should have knowledge of automobile mechanics.

RELATED CIVILIAN OCCUPATIONS	ADDITIONAL TRAINING REQUIRED	PHYSICAL ACTIVITIES	WORKING CONDITIONS
0-61.80 TRANSMITTER TESTER 4-97.930 RADIO-AND-ELECTRICAL INSPECTOR 5-83.411 RADIO REPAIRMAN I 5-83.413 TROUBLE SHOOTER VI 5-83.415 PUBLIC-ADDRESS SERVICEMAN 5-83.445 ELECTRICIAN, RADIO I 5-83.447 RADIO MECHANIC II 6-98.220 RADIO-TECHNICIAN HELPER	Brief training to learn methods of inspecting, testing, and repairing a variety of radios and radio equipment.	Great fingering Moderate walking, reaching, handling, seeing, hearing Little standing, sitting, bending, lifting, pushing or pulling, depth perception	inside oily, electric shock, dirty
0-61.20 RADIO DISPATCHER 0-61.30 RADIO OPERATOR 0-61.32 RADIO OPERATOR, FLIGHT 0-61.33 RADIO OPERATOR II 0-61.50 FIELD ENGINEER 0-61.60 AIRPORT-CONTROL OPERATOR 0-61.61 DISPATCHER XII 0-61.65 INSTRUMENT-LANDING-TRUCK OPERATOR 0-69.47 RADIO-OPERATOR APPRENTICE	Brief additional training in commercial broadcasting procedures; or, in operating direction-finding equipment; or, in authorizing and directing commercial airplane flights.	Great fingering Moderate handling, talking, seeing, hearing Little walking, standing, bending, reaching	inside noisy electric shock
5-81.010 AUTOMOBILE MECHANIC 5-81.020 MOTORCYCLE REPAIRMAN 5-81.030 TRUCK MECHANIC 5-81.040 TRACTOR MECHANIC 5-81.120 BRAKEMAN, AUTOMOBILE 5-81.210 WHEEL-ALINEMENT MECHANIC 5-81.530 AUTOMOBILE-GENERATOR REPAIRMAN 5-81.410 AUTOMOBILE-RADIATOR MAN 5-81.610 AUTOMOBILE MECHANIC, MOTOR I 5-81.630 MOTOR AND CHASSIS INSPECTOR 5-81.650 AUTOMOBILE MECHANIC, DIESEL ENGINE 5-81.910 AUTOMOBILE-REPAIR SERVICEMAN 5-89.411 BATTERYMAN II	Brief additional training to become familiar with types of engines, assemblies, and structural parts used in automobiles, tractors and motorcycles; or training in methods of servicing automobiles.	Great handling, fingering Moderate standing, bending, reaching, lifting, pushing or pulling, seeing, hearing, depth perception Little walking, carrying touching, turning	inside oily, odors, noisy, dirty burns, bodily injury, cramped, vibration

Figure 4

able moving pictures which illustrate jobs held by workers having unusual physical limitations.

Future Trends

The future of *Physical Demands Analysis* and *Physical Capacities Appraisal* is associated primarily with the stringencies of the labor supply market and the vocational rehabilitation of disabled war veterans. A scarcity in the supply of workers will result in an increased demand for reserve workers such as women, older persons, and persons having unusual physical limitations, all of whom are best placed when the physical requirements of the job and the worker's physical capacities are effectively matched. Even if there is no critical stringency in the labor market, progressive post-war employment policies may create a demand for handicapped workers and there may be a continuation and expansion of the present program.

Any progress in the employment of physically limited persons will be reflected in the vocational guidance of potential workers. Counselors and teachers may very well take advantage of the available occupational information and statistical data and use the analysis and appraisal techniques.

The use of the technique for the vocational rehabilitation of disabled war veterans has already been introduced into the "selective placement" program of U. S. Employment Service.

All employers participating in rehabilitation programs will need to set up their own "selective placement" program based on *Physical Demands Analysis* and *Physical Capacities Appraisal*.

VII

Describing Jobs

Early in the program of the Division of Occupational Analysis and Manning Tables it was evident that comprehensive information about jobs was essential for a sound approach to employment, personnel, counseling, and related activities. One of the initial aims of the program, therefore, was to describe jobs in such a way that the information would have maximum application to all phases of these activities. The job analysis program begun in 1934 provided much information in the form of specific job analysis reports, local job specifications, and industrial process data from industries in all parts of the country. The combination of all information collected on a local basis was undertaken to develop job descriptions which would present a composite, national picture of occupations. These descriptions included information about the steps of the work performed, the equipment and materials, the relationships to other jobs, lines of promotion, physical demands, and hazards of the occupation in order to provide a broad picture of the way in which the job was done, the worker who would do the job, and the conditions under which he would work.

Industrial Job Descriptions

The first attempts to write job descriptions were based on studies in the laundry industry prepared by research groups in the New York State Employment Service during the winter of 1934–1935. The Division of Occupational Analysis and Manning Tables next prepared studies in the cotton textile industry. These two studies provided the experience that guided the development of job descriptions on a wide coverage, initiated in the spring of 1935.[1]

Inasmuch as original field data were obtained on an industrial basis, it was considered desirable to present job descriptions on

[1] Stead and Masincup, *The Occupational Research Program of the United States Employment Service*, (Chicago: Public Administration Service, 1941), pp. 45–61.

the same basis. The greatest need for this information was in those industries which had the largest employment and were the most wide-spread geographically. The order of processing was based on these two factors, with due consideration of the extent to which the industries offered opportunities for employment. In those instances where pressing local needs demanded the immediate processing of descriptions for occupations in industries other than those being covered on a national basis, job description work was undertaken by the Field Research Centers of the Division or by the operating State Employment Services under the technical guidance of the Division.

The two types of industrial job descriptions prepared at this time were National Job Descriptions and Local Job Descriptions. The National Job Descriptions were based on wide-spread coverage of the jobs and were intended for nation-wide use. The Local Job Descriptions were based on the occupational findings in one area, frequently in only one or two establishments. They were intended for use only in the originating state or in one locality within a state. Wherever National Job Descriptions existed, it was simpler and more efficient to adapt them to the local situation by comparing or "verifying" the composite descriptions with local conditions and merely noting exceptions and additional information, rather than developing original local information.

In the preparation of National Job Descriptions all the field-analysis reports that described the same occupation in a given industry were grouped for evaluation and a composite description of the occupation was prepared. Where necessary, supplementary information from outside sources was obtained to assure as complete information as possible. After the job descriptions for an entire industry were prepared, copies were sent to representative employing establishments, trade associations, unions, and qualified experts for verification. To insure a more complete understanding of the job in its relation to others in the industrial process, a narrative account of the industrial organization and flow of activity was prepared for the industry.

National Job Descriptions covering fifteen significant industrial groups of occupations were published from 1935 to 1940. Each volume contains a narrative account of the industrial organization, a bibliography, separate descriptions for each job in the industry, a glossary of terms, and an index. In many instances, illustrations have been provided. These volumes describe at least 2,000 separate occupations, representing possibly more than 50 per cent of the working population. Local Job Descriptions, which are still in use, were developed for 95 industries during this same period.

Placement Guides

Increasing use of industrial job descriptions by United States Employment Offices, by trade schools, counseling, and vocational rehabilitation groups, revealed a need for additional specific job information which could not be presented in the industrial approach. More material was in demand, for example, concerning the variations in a particular occupation as it was found in different industries, in different plants, and even in different departments of a single plant. Accordingly, State Employment Service research groups and field research centers under the technical guidance of the Division prepared placement aids, regardless of industry, under titles such as "Registration and Placement Aids," "Placement Guides," and "Interviewing Aids."

Job variations were found to be important in a job description because of the following conditions which might affect the way in which the job was done and the kind of worker who would do the job:

Kind of establishment *e. g.*, job or production shop.
Method of performing the work, *e. g.*, hand or machine.
Kind, make, size of machines and equipment used.
Work phases performed, *e. g.*, lay-out, assembly, fabrication.
Products made or services rendered.
Materials used.
Accuracy or degree of skill required.
Method of work direction, *e. g.*, blueprint, verbal instruction.
Degree of responsibility.
Work specializations.

Supervision and training of other workers.
Working conditions and hazards.
Training, education, and legal requirements.

This experience provided a basis for the next step in the national program of developing job descriptions.

Currently Active Occupations Series

The need for the "variable" type of information led to the development of national descriptive material for single occupations regardless of the industry in which they occurred, rather than for the occupation as it occurred in a particular industry. Following experimental work in the summer of 1940, the Division published "Currently Active Occupations Series," temporary releases on occupations vital in the defense emergency. These publications incorporated parts of the composite approach to job descriptions and some of the findings on job variables. They included information to aid in the classification of workers according to the *Dictionary of Occupational Titles*, the selection of workers with related experience, and the selection of trainees. Such data were intended to promote consideration for critical defense jobs of technologically displaced workers, inexperienced and handicapped individuals, and workers from less essential activities.

Descriptions of Occupations

The "Currently Active Occupations Series" was continued for more than a year to meet the pressing need for occupational information on critical jobs. In the autumn of 1941, however, this approach was changed in favor of job descriptions of more permanent value. Plans for preparing these job descriptions were based upon the full span of experience in this field, from the original development of industrial materials in 1935 through the gradual change to specific occupational descriptions to meet local needs or national emergencies.

A National Job Description as it has been developed since 1941 is a composite picture of a selected occupation as it is performed in the various industries and in the several types and sizes of establishments in which it may occur. This approach to job description eliminates: (1) the need to repeat descriptions for the same occupation in different industries and (2) the need to make extensive local adaptations of the information developed on a nation-wide basis. The National Job Descriptions now prepared illustrate the type of information which can be produced for nation-wide use by a headquarters research group.

Job analysis reports covering the occupation as it occurs in various industries continue to be the primary source of job data, since the reports are the record of actual observations of workers performing the job. These reports are studied carefully in order to establish the scope of the job and determine its major elements. Data thus discovered may be sufficient, but frequently the writer has to use the information as a guide for further research into other sources, such as trade journals, machinery and equipment catalogs, textbooks, and vocational training course outlines.

A complete job description contains a job summary, a statement of the job variations, an outline of significant duties and requirements, a detailed description of the work performed and the equipment used and, in addition, a statement of the usual physical demands and working conditions associated with the job. These details give the picture of the occupation, covering points which may be significant either for placing a worker in the job or for learning what an employer requires in a worker.

In addition to the job information, a good job description contains suggestions as to sources of workers with related experience, an outline of the elements of the job important to training new workers, and a statement of points to consider in selecting trainees. These details are helpful in guiding a worker to the job and, added to the job information, provide in the completed job description necessary data for determining to what extent the job can be performed by a specific individual.

Each section of the Job Descriptions, now prepared by the Division of Occupational Analysis and Manning Tables, has a specific use and is developed according to definite principles of content, aprpoach, and presenta-

tion. The Job Descriptions are intended for use in many situations where speed of reference is important, and the order in which the parts of the information are given is based on such use. Below is a description of each section of the Job Description in the order in which it appears in the published material. The heading of the description is given in terms of the *Dictionary of Occupational Titles*[2] in order to identify the occupation with that standard reference work and to make the description most useful in offices of the War Manpower Commission, which use the *Dictionary* in classifying jobs and job seekers.

Job Summary

Immediately below the heading of the Job Description is placed the *Job Summary*. This is a brief, concise statement of what is done on the job, how and why it is done, what materials are used, and what products are made. It gives a quick understanding of the job and orients the user of the material, without confusing him with details.

The *Job Summary* should be a single, compact sentence. "What is done, how, with what, and for what purpose" is a logical order of presentation.

The heading of the Job Description for TOOL DESIGNER and the *Job Summary* illustrate the introduction to a Job Description:

JOB DESCRIPTION for
TOOL DESIGNER
0-48.41

JOB SUMMARY
Plans, develops, and sketches or makes detailed scale drawings of working designs for the manufacture of tools, jigs, and fixtures to be used with machine tools in shaping metal articles or parts.

Employment Variables

Occupations of the same fundamental character and called by the same title vary widely from one industry to another, from plant to plant within an industry, and from one department to another within a plant. Even geographic location may affect the way in which a job is done and its physical, legal, or traditional conditions.

These variations in an occupation have real bearing on vocational guidance, particularly on placement. Knowing the different possible variations in the job aids materially in determining the way in which a worker will fit the job.

To present the data in the briefest possible form, the *Employment Variables* section of the Job Description has been devised. The method of presentation is simple: a heading for each of the fields in which variations may occur and a listing of alternatives. Where numerous alternatives exist, the most important are given and the word "others" indicates that the list is incomplete. The areas of variation differ from job to job—in one job they may be type of shop, make of lathe, size of machine, operations performed, tolerances, and type of training; in another, type of ship, material worked on, job classification as to level of skill, and performance of related tasks.

The Employment Variables section lists only those variables which materially affect the job performance and the qualifications of a worker. Determining this significance of job variations depends considerably upon knowledge of the occupation and upon an evaluation of each variable against all others.

An example of an *Employment Variables* section from the Job Description for ARMATURE WINDER follows:

EMPLOYMENT VARIABLES

The following factors should be considered in taking applications and employer orders.

Kind of Armatures Wound
- Generator:
  - A. C.
  - D. C.
- Motor:
  - A. C.
    - single phase
    - polyphase
  - D. C.
    - series
    - shunt
    - compound
  - Universal

Size of Armatures Wound
- Generator: Specify in kilowatts
- Motor: Specify according to horsepower

Type of Coil Inserted
- Diamond
- Involute
- Concentric
- Shuttle
- Other (specify)

Method of Determining Winding Specifications
- Blueprints
- Stripping records
- Diagrams
- Verbal instructions
- Other (specify)

The stripping record contains winding specifica-

[2] *Dictionary of Occupational Titles*, Parts I and II, 1939. *Supplement to the Dictionary of Occupational Titles*, 1944. U. S. Government Printing Office, Washington, D. C.

tions that are determined and recorded during the removal of the original winding from the armature.

Experience in Dismantling and Rewinding Used Armatures

Significant Job Factors

The Job Description has so far provided a quick summary of the occupation and an outline of the areas of variation in its performance. The next section, *Significant Job Factors*, provides a concise summary of the basic skills and knowledges essential to performance of the job. These factors give a picture of the "job constants." A worker who is to be classified as experienced in the occupation should fulfill all of the significant job factors, and a job which is to be considered as falling under the occupational title on the Job Description should require all of the significant job factors.

These factors are referred to again in the Job Description, since they form the basis for the determination of job relationships and training needed. This use of the *Significant Job Factors* in preparing those parts of the Job Description indicates immediately how they may be used generally. Knowing the "constants" of the occupation provides the basis for setting up training courses and for singling out those functions which make jobs related to each other and, hence, make workers with a particular training and experience also partially prepared for employment in other occupational fields.

The example of *Significant Job Factors* given below is taken from the Job Description for FOUR-COLUMN-HYDRAULIC-PRESS OPERATOR:

SIGNIFICANT JOB FACTORS

The following skills and fields of knowledge are basic in this occupation and are usually taught in the training of new workers.

1. Ability to bend and shape steel plates and structural shapes on a four-column hydraulic press.
2. Familiarity with the principles of hydraulic-press construction and operation.
3. Familiarity with hot- and cold-bending characteristics of heavy steel plates and shapes.
4. Experience in selecting and installing dies.
5. Experience in using blocks and shims to regulate degree of bends.
6. Ability to work from blueprints, templates, or layout lines.
7. Ability to follow lay-out markings.

Other Sources of Workers

Breaking a job down into its basic performance requirements reveals that many of these requirements appear in other jobs. Information in the Section, *Other Sources of Workers*, includes a listing of the most closely related jobs in terms of the significant job factors previously determined. Consideration of such sources of workers is valuable in all phases of vocational guidance, but applies particularly in the present need for the rapid upgrading, transferring, and training of workers to perform skilled work.

A study of the methods of promoting, transferring, and training for the job in question reveals job relationships. In the Division, job analysis reports, Job Families, and the *Dictionary of Occupational Titles* provide specific sources of information on job relationships and the listing of *Other Sources of Workers* is readily derived from these materials. The following example of *Other Sources of Workers* is from the Job Description for FOUR-COLUMN-HYDRAULIC-PRESS OPERATOR:

OTHER SOURCES OF WORKERS

When no fully qualified workers are available, the following occupations present sources from which workers may be drawn. These have been selected on the basis of similar job characteristics and are presented in the order of decreasing similarity of skills and materials involved. However, in each instance the qualifications of the individual worker must be taken into consideration. The numbers following each occupation indicate the Significant Job Factors that are usually found in the related occupations, as well as those that are usually lacking and in which the worker would have to be trained.

		Present	*Absent*
6-88.740	JOGGLE-PRESS OPERATOR	2,3,4,5,6,7	1
4-86.140	SECTIONAL-HYDRAULIC-PRESS OPERATOR	2,3,4,6,7	1,5
6-88.742	FLANGING-PRESS OPERATOR	2,3,4,6,7	1,5
6-86.120	FORGING-PRESS OPERATOR	2,3,4,7	1,5,6
4-86.150	DISHING-MACHINE OPERATOR	2,3,4,7	1,5,6
4-86.120	HAMMERSMITH	3,4,6,7	1,2,5
4-86.110	DROP-HAMMER OPERATOR II	3,4,6,7	1,2,5
4-86.010	BLACKSMITH II	3,4,6,7	1,2,5
6-88.612	STRAIGHTENING-PRESS OPERATOR	2,3	1,4,5,6,7
6-88.716	SECTIONAL-HYDRAULIC-PRESS LEVERMAN	2	1,3,4,5,6,7

Work Performed

The *Job Summary* and *Significant Job Factors* in the Job Description provide a highlighted picture of the occupation. However, in many phases of vocational guidance a complete picture of the occupation—its performance step by step—is necessary. This is provided in the *Work Performed* section of the Job Description. It enables the reader to visualize the job, to see what the worker does in starting his job, carrying out each duty, and finishing with a product which can be called his output.

Such a job picture should be presented in narrative form. Yet here again it is easier to use the information if certain statements are highlighted and if each separate function of the job is given as a whole. Flag statements at the beginning of each paragraph of a Job Description label and differentiate the major elements. Together these flag statements present a complete job summary. The number of major elements into which the job is broken down depends upon the total number of tasks to be performed and the degree of breakdown essential to clarity.

The section on *Work Performed* may occasionally be prefaced with an explanatory statement, containing such information as the relative position of the job in an industrial process, differences between this job and similar jobs, the type or source of material handled by the worker, and other pertinent facts. Technical terms used in the work performed which may not be commonly understood are italicized, to indicate that a description is given in another section. The following example of *Work Performed* is taken from the Job Description for SHEET-METAL WORKER II:

WORK PERFORMED

1. Plans and lays out work: Studies blueprints and sketches of the article to be made and checks specified dimensions against actual dimensions at the point of installation; selects material according to specifications and lays out required figures or patterns from blueprints, sketches, or *templates;* makes measurements with rule, square, and *dividers;* uses marking instruments such as *scriber*, or chalk to mark lines on material; locates reference points or centers for holes by indenting metal with *center punch*.
2. Fabricates parts: Cuts sheet metal along scribed outlines, using hand or power-driven cutting tools such as *power squaring shear, rotary shear*, acetylene cutting torch, *slitting shear*, or *power hacksaw;* bends sheet metal along marked outlines to specified angles on a *bending brake;* uses *beading machine* to raise a bead on or near the edge of the metal to reduce its flexibility; uses *seaming machine* to make open lock seams; pounds red-hot sections of sheet metal with wooden mallet on cast-iron molds of specified size and curvature to form concave or convex surfaces; smooths out irregularities with *bumping hammer;* may curve sheet metal to specifications by using a *roll-forming machine;* may heat parts with a blow torch before bending or forming; drills holes for bolts, rivets, and screws with *punch press* or *portable hand drill*.
3. Assembles units: Fastens sections of sheet-metal assemblies together by bolting, cementing, nailing, screwing, soldering, welding, or riveting parts according to specifications; closes lock seams by hammering them together.

Equipment and Definitions

Placement and training officers and vocational counselors frequently require information about the machines, equipment, and materials used in an occupation. This information is especially significant in the placement and training of women, the physically handicapped, and youth. Legal regulations restricting employment of these groups are often based on the kind of machines and materials used. In addition, this information provides a clearer understanding of exactly what may be involved in the use of the machines, materials, or tools of the job.

Descriptions of machines and equipment in the Job Descriptions cover details which are significant as far as the worker's use of them is concerned. These non-technical definitions are presented so as to define simply the purpose or function of the mechanism, its physical appearance, and its operation. Following is an illustration of the type of information furnished:

EQUIPMENT AND DEFINITIONS

The usual equipment for this occupation includes metal-working machines such as roll-forming machine, seaming machine, power squaring shear, rotary shear, slitting shear, bending brake, and punch press; hand tools such as snips, hammer, chisels, file, mallets, portable hand drill, portable buffing wheel, and portable grinder; precision measuring devices such as rule, square and dividers, marking devices such as scriber and center punch.

Beading Machine: A bench-type hand-operated machine used to press a raised bead at or near the edge of the metal to reduce its flexibility. The machine presses the metal to shape between two rotating circular dies.

Bending Brake: A metal-bending machine used to bend sheet metal or light plate stock at angles. The machine has two straight-edged blades, one stationary and mounted flat to support the work, and the other

hinged parallel to the first in such a way that when moved it bends the overhanging edge of the plate or sheet against the edge of the stationary blade. Sheet-metal brakes may be hand or power operated.

Bumping Hammer: A reciprocating motor-driven hammer used to smooth roughly shaped curved metal parts.

Center Punch: A pointed, pencil-like tool used for making small indentations in metal to locate points or centers for holes.

Dividers: A measuring or marking instrument consisting of two legs that are pointed at one end and joined by a hinge or pin at the other. It is used to mark off measured distances in lay-out work.

Training Brief

Information on job training is particularly important in the guidance of inexperienced workers and in setting up training programs.

The *Training Brief* section of the Job Description includes a statement of the usual methods of preparing workers for the occupation, either through pre-employment or on-the-job training. The basic operations and knowledges required on the job which lend themselves to training and without which the job cannot be performed, are given to indicate how a new worker might be trained.

The *Training Brief* given below is taken from the Job Description for TILTING-FURNACE OPERATOR:

TRAINING BRIEF

Introduction into this occupation is usually through on-the-job training. Foundry practice graduates from recognized trade schools may be tested by establishment supervisors to determine the applicants' qualifications. Those who are considered capable of performing the tasks of this occupation are assigned such tasks.

Inexperienced applicants are hired as trainees or as helpers for the specific job of TILTING-FURNACE OPERATOR. Such helpers learn the various trade phases mainly by virtue of their own initiative and abilities. The time involved in producing skilled workers varies according to the individual trainee and the adequacy of the training program.

Training for this occupation should include:

Charging, operating, and maintaining a tilting furnace.

Knowledge of proper pouring temperature of molten metals as determined by pyrometer or visual inspection.

Knowledge of melting characteristics of various metals and alloys.

Familiarity with foundry processes.

Trainee-Selection Factors

The guidance of inexperienced workers and of experienced workers who must change their vocation demands the evaluation of the individual as a possible trainee in the job selected. Information concerning the individual's education and training, experience, and even casual hobbies or interests may have bearing on the likelihood of successful training for and performance in the job.

In the Job Description, *Trainee-Selection Factors* include: (1) reference to the classification of the trainee according to the *Dictionary of Occupational Titles* (Part IV, Entry-Occupational Classification), (2) statements of vocational and general educational courses which would provide some background of knowledge or ability for the occupation, (3) suggestions as to types of work experience which would be useful to the prospective trainee, and (4) hobbies or interests frequently leading either to an indication of interest in the direction of the selected occupation or an indication of potential ability to perform the occupation.

The *Dictionary of Occupational Titles*, Part IV, provides a ready source of information useful in preparing trainee-selection data. Occupational fields are treated in Part IV, but the data can easily be refined to pertain to a given occupation, particularly after the Job Description has been thoroughly developed.

An example of *Trainee-Selection Factors* has been taken from the Job Description for PLUMBER, AIRCRAFT:

TRAINEE-SELECTION FACTORS

Trainees should be selected from among those classified in the entry-classification:

4-X6, Crafts

The following factors should be considered in selecting trainees from the applicants found in that classification:

1. Education. Special consideration should be given to persons with high school, vocational school, or trade school education who have completed courses in one or more of the following subjects:
   - Mechanical Drawing, for ability to read blueprints, detailed work sketches, and plans, and to acquire accuracy in performing detailed and precise work operations.
   - Manual Training, for experience in the use of hand tools.
   - Sheet-Metal Work, for experience in handling and working with metals and in using metal-working tools and machinery.
   - Plumbing Shop Practice, for general pipe fitting and plumbing techniques and skills, and for experience in the use of standard plumbing tools.
2. Work Experience. Preference may be given to applicants who have had full-time, part-time, or vacation experience working in such industrial processes as:
   - Aircraft Manufacturing.
   - Automobile Manufacturing and Repair.
   - Construction.

Locomotive or Railroad Car Manufacturing.
Metal Furniture Manufacturing.
Plumbing.
Ship and Boat Building and Repair.

3. Hobbies. Pursuit of such hobbies as the following may indicate the acquisition of related skills:
Automobile Repairing.
Home Workshop (metal).
Model Building (locomotive, airplane, ship).
Plumbing.
Radio Repairing.

Physical Demands

Physical demands made upon the worker in the performance of jobs play a large part in the effective guidance of some persons. While the vocational counselor may be aware of the physical limitations of the individual, he should know also the physical demands of jobs in order to evaluate the physical limitation. Even general information on physical activities such as walking, climbing, standing, lifting, hearing, and seeing, and the extent to which they are required on jobs, allows for an initial consideration of the worker's vocational possibilities.

In the Division special reports made through job observation provide information on physical demands for a Job Description. The Job Description outlines the usual demands associated with the job. The job may be done in other ways or special provisions may be made to eliminate certain demands, but with the knowledge of the usual requirements, the counselor can investigate possible variations and measures for improvement.

The *Physical Demands* section includes: (1) the main physical activities in single, highlighting words, (2) the degree of requirement of the activity (great, moderate, or little), and (3) the way in which the activity is required, as a preparation for discovering either a variation or the possible elimination of the requirement.

The *Physical Demands* for LOFTSMAN as given in the Job Description appear below:

PHYSICAL DEMANDS

Consideration of the following physical activities that are usually required for satisfactory job performance will aid in the placement and utilization of applicants who possess some physical limitations.

Walking:	*Moderate:* around mold loft floor, woodworking machines, and supply room.
Standing:	*Moderate:* to operate woodworking machines.
Sitting:	*Little.*
Bending:	*Great:* to lay out and construct molds on floor.
Reaching:	*Moderate:* to make full-scale lay-outs and operate woodworking machines.
Lifting:	*Moderate:* to move molds.
Pushing or Pulling:	*Little.*
Handling:	*Moderate:* to grasp hand tools and mold materials.
Fingering:	*Little.*
Talking:	*Little.*
Seeing:	*Moderate:* to read blueprints, use measuring devices, and discern fine lines marked on floor.
Hearing:	*Little.*
Carrying:	*Moderate:* to carry molds and mold materials during fabricating and assembly operations.

Working Conditions

Information on the working conditions under which a job is performed is frequently important both to the prospective worker and his counselor. Although it is often difficult to generalize on working conditions, because of the wide differences in plants and jobs, indications of the most common situations are helpful.

Working Conditions data as given in the Job Descriptions published by the Division of Occupational Analysis and Manning Tables are obtained with the physical demands information and reflect a picture of the findings of field analysts in observing the occupation in its performance all over the country.

A sample of the *Working Conditions* for an occupation in which they are important factors has been taken from the Job Description for TILTING-FURNACE OPERATOR:

WORKING CONDITIONS

Inside:	In foundry furnace shop
Hot:	From intense heat of furnace or metal during heating and pouring operations
Dusty:	From limestone and similar flux materials
Odors:	From melting metals
Burns:	From spattering molten metal or hot furnace
Dirty:	From handling scrap metal or ingots

VIII

Developing and Using Measures of Skill

THE DIVISION has developed and standardized a number of proficiency tests for measuring the occupational knowledge and skills of workers. These measures are useful in counseling for occupational adjustment, in facilitating the maximum utilization of a worker's skills, in classifying workers accurately, and in placing a worker in a job.

The development of techniques for the measurement of occupational proficiency began in 1935 when Oral Trade Questions were collected and verified, and Performance Trade Tests were standardized for Typists and Stenographers. To date, sets of Oral Trade Questions have been installed in 1,204 local offices of the United States Employment Service. The Performance Trade Tests have been installed in 410 offices. During the past years there have been a number of changes in research procedures and some additions of different types of trade tests. The most significant changes in the development of Oral Trade Questions have been the reduction of developmental steps from six to two, and in the shift from a nation-wide verification to a local verification to meet specific needs of labor market areas within a comparatively short time. Notable additions include the introduction of pictures and the development of trade tests for comprehensively evaluating a worker's knowledge of all duties of a job.

KINDS OF TESTS

The following types of Trade Tests have been developed:

Oral Trade Questions.—Developed for a specific occupation, these consist of sets of from twelve to twenty questions which are administered orally as an integral part of a registration or referral interview. This type of test has been developed for 230 skilled occupations. A few sample trade questions for the occupation of Airplane-Engine Mechanic follow:

1. What is the firing order on a Double-Row Cyclone, 14 Cylinder, Pratt and Whitney Engine?
2. What color C.A.A. identification band is used on a fuel line?
3. What should be the reading in pounds per square inch, on the automatic pilot pressure gauge after the engine has been started?

Picture Trade Questions.—These are sets of questions for a specific occupation, similar to the sets of Oral Trade Questions, but with the addition of photographs or graphic illustrations showing a worker operating a machine, using tools, or repairing equipment, or any materials, techniques, etc., which are pertinent to the job. During this type of test, the pictures are shown to the worker while the interviewer asks the questions. Five tests of this type have thus far been developed.

Blueprint Reading Trade Questions.—These are similar to the Picture Trade Questions in format and are used whenever the worker is required to read blueprints as part of his job. Tests of this type have been developed for three occupations.

The Oral Trade Questions, Picture Trade Questions, and Blueprint Reading Trade Questions are administered orally and informally as an integral part of an interview without reference to a test. These techniques for measuring occupational proficiency have many practical advantages in counseling and placement because they are especially adapted for use in an interview. Following are the most important advantages: (1) An interviewer need not have a knowledge of the trade in order to use them; (2) they are easy to score; (3) they require only a short time for administration (from four to eight minutes); (4) the scoring method yields a value which is independent of subjective estimates; (5) they do not require the use of tools or equipment; (6) they are bound in volumes convenient to handle; and (7) the trade questions increase the interviewer's trade knowledge.

Performance Trade Tests.—In these tests the applicant performs the actual duties of the job. Work-sample exercises on typing and taking dictation, using shorthand characters and transcribing them, constitute the tests of this type. These exercises are administered formally according to the standardized procedures used in their development.

Proficiency Utilization Tests.—These consist of sets of from fifty to seventy-five trade test items which have been selected on the basis of weighted applicability to all job duties of an occupation. Written or oral questions, pictures, blueprints, and performance tasks may be used. This type of test is still in the experimental stages, with two studies having been completed.

They are called "Proficiency Utilization Tests" because they furnish not only a general measurement of the extent of knowledge and allied skills, but also a detailed diagnosis of a worker's qualifications for the particular job duties in which he is most capable or in which he is partially qualified and needs supplemental training, thus facilitating his maximum utilization on a job. A measurement of this kind is especially significant for those occupations which have been re-engineered during the war-time speed-up in production methods. For example, at one time there may have been on a job only a machine operator who was an all-round journeyman, doing both the set-up and operation of the machine; today there may be an operator who only tends the machine, plus a job setter who makes the set-up for a number of operators; and in addition, in some establishments, the all-round journeyman may still exist. The Proficiency Utilization Tests are used primarily in vocational counseling, in the allocation of workers to jobs at the skill level for which they are best qualified, and in identifying specific job tasks in which the worker needs supplemental training.

Functional Proficiency Tests.—These measure knowledge or skill factors found in many different occupations. A written test for spelling proficiency or a set of Picture Trade Questions on the ability to read micrometers are examples. Five tests of this type have been developed.

Uses of Trade Tests

Of the many uses which have been made of proficiency measuring tests the following are most pertinent:

1. *To Bring Out Information on the Worker's Past Experience.*—Asking Trade Questions during a counseling interview may induce a reticent applicant to talk about his work experience. Answers to questions also may reveal important work experience when an applicant underestimates his qualifications.

2. *To Substantiate a Worker's Claim to Having Had Certain Work Experience.*—The results from administering Trade Questions provide additional information for the interviewer and convince the employer that the physically handicapped person or a worker of a minority race has trade knowledge comparable to expert workers in the particular occupation for which a placement is being made. In addition, the Trade Questions may also verify the trade knowledge of a physically handicapped person for an occupation wherein he was employed before becoming physically handicapped.

3. *To Clarify Any Doubt an Interviewer or Counselor May Have with Regard to a Worker's Qualifications.*—Interviews in which this may be a factor include: when young applicants claim a considerable amount of work experience; when an applicant claims experience during a follow-up interview which does not appear on the record from previous interviews; when an applicant is vague about the names of places where he has worked; and when the applicant claims to be an expert but the record of his wages indicates lower wages than experts usually receive.

Additional situations, in which Typing and Dictation tests are especially pertinent, include: when an applicant is a recent graduate and lacks work experience, or when she may have been employed on a job which did not fully use her typing or dictation skills. Since typing and dictation skills depreciate from lack of use, it is important to know the degree of her efficiency when the worker goes on a job.

4. *To Verify a Worker's Trade Knowledge Before Referring Him to a Job in Another Location.*—To transfer an unqualified worker to a critical job is costly both in time and money. A rough estimate of a worker's

qualifications is not sufficient when a specific job has to be done.

5. *To Facilitate the Handling of Mass Interviewing of Job Applicants.*—When thousands of applicants apply for jobs at large construction projects which are widely advertised, mass interviewing results. A director of a State Employment Service wherein the interviewers had to handle more than 10,000 applicants within a limited time, pointed out the usefulness of Trade Questions when he said, "Frankly, we could never have met our labor demands on schedule if it had not been for those Construction Trade Questions."

6. *To Measure the Extent of Improvement Resulting from Supplementary Training or Work Experience.*—Performance Trade Tests are used extensively for this purpose. Retests with equivalent alternate forms of Typing and Dictation exercises may be used when an applicant, who received a low score originally, has attempted to improve by going to school or practicing at home. Concerted application in practicing may improve a worker's skills so that she will qualify to meet job requirements and thus be employable. If a person fails to improve after concerted practice or re-training, it may be concluded that her ability in such work is limited and she should be advised to direct her efforts toward another field.

Proficiency Utilization Tests are also used in considering candidates for upgrading.

7. *To Facilitate the Most Effective Utilization of a Worker's Abilities.*—Measurements which provide diagnostic results such as are obtainable from the Performance Trade Tests, the Functional Proficiency Tests, and the Proficiency Utilization Tests may be used to match effectively a worker's knowledge and skills with designated specifications of a job. The Typing exercises, for example, are scored separately for speed and for accuracy, thus enabling the selection of a person qualified to be a receptionist, who occasionally types cards, as well as the selection for a job where continual typing is demanded on a metered production basis. The dictation exercise results may also be applied specifically since they are scored for accuracy for any of three speeds. The Spelling Test is useful not only when placing stenographers, but also when placing typists, since successfully employed typists who work from dictaphone or similar recordings have tended to score above the average for typists who did not work with such equipment. Typists working solely from corrected copy have less occasion to need spelling ability. Proficiency Utilization Tests enable the utilization of a worker's abilities at the proper skill or grade level since they are standardized for the duties of a specific job in a specific plant. Even if an applicant is truthful, it is difficult for an interviewer to discover the job elements in which the prospective employee is proficient. For example, in one establishment, a spray painter who represented himself as a "first-class man," was hired at first-class rates, and sent to the paint shop.

There, his first move was to jam the spray gun by connecting the paint hose to the air tube. In his last job, it had not been necessary for a first-class painter to do anything but manipulate the gun. However, he was far from a first-class painter in an establishment where a worker with a first-class designation has to adjust spray pressures, connect the equipment, and be responsible for its cleanliness and efficient operation. The Proficiency Utilization Tests reveal an applicant's limitations before he is assigned to a job classification which it would later be embarrassing to change.

8. *To Prescribe a Proper Course of Training.*—A Proficiency Utilization Test points out at once where an applicant or worker may require training. For example, a worker experienced in using hand tools on a boatbuilding assembly line may lack a working knowledge of blueprint reading, fairing, or the shaping of boat framing. If this worker's deficiency is known, training may be arranged to bring his qualifications up to the requirements of the job.

Developmental History

Since trade test development was initiated in March, 1935, there have been two major changes in developmental procedures for sets of trade questions. The first was in 1940 when the stages of the standardization process were reduced from six to five, and the second was in 1943 when they were further reduced to two stages. The six stages of the original procedure were: (1) collection of questions in connection with job analyses made by analysts in various parts of the country, (2) review in the Washington Office for

compliance with standards for good test items, after which they were compiled according to job title, (3) preliminary verification on expert workers in each field center, (4) review in the Washington Office of the results of this preliminary verification to determine the degree to which the trade information in the questions was held in common by experts in various parts of the country, (5) regular verification in each field center on expert workers, beginners or helpers, in the same occupation, and workers in closely related occupations, and (6) analysis in the Washington office of the results to determine the answers to be used for the questions, to identify the questions which most effectively differentiated experts from the other two populations, to select a set of from 12 to 20 questions for use, and to establish norms for workers who were "well informed," who had "some information," and who had "little information." Questions were selected on the basis of critical ratios of differences between percentages of workers in the expert and non-expert population who answered the questions correctly. In 1940 the procedures were changed to eliminate one stage. The collection of questions and the preliminary verification were made in only one field center, and the preliminary verification was changed to include a population of workers in closely related occupations as well as a population of beginners or helpers whenever such workers were discretely identifiable. The nation-wide preliminary verification (step 3) was discontinued because differences in answers from expert workers in various geographical locations were negligible.

In 1943 Trade Questions were developed for use in a specific labor market area and the number of stages was reduced from five to two. Instead of collecting, verifying, reviewing, and re-verifying, questions are now carried through an evolutionary formulation and verification by interviewing populations of from fifteen to twenty-five expert workers, and from ten to fifteen workers in closely related occupations, or workers who are beginners. Making a comprehensive occupational survey which includes the identification of knowledge and skill factors on job duties, the formulation of trade questions cooperatively by discussion between expert workers and Trade Test Analysts, and the verification of trade questions is a cumulative, evolutionary process, as the analyst interviews one expert worker after another. After workers are interviewed in each population, a brief statistical analysis is made to determine the norms to be used and the set of questions is made immediately available to the local Employment Service offices. When the Trade Questions are needed for the same occupation in another area, a short verification with the usual statistical analysis is made. All trade questions must conform to the following quality standards: (1) careful formulation from discussion with expert employed workers, in shop language, (2) pertinent to significant job duties, (3) specific, not ambiguous, (4) short answers, and (5) unanimity on a few answers.

When the Trade Question program began, primary emphasis was on statistical discrimination between experts and non-experts. Experience proved, however, that their application was limited by the factor of worker and interviewer acceptance which is just as important as discrimination. If interviewers feel that the tests are not fair, or if experts ridicule them, the results are not likely to be given serious consideration. In general, it has been found that expert workers prefer the direct question-and-answer type. The "confusion items," in the multiple choice form of question, tend to irritate many expert workers who consider them "silly." The multiple choice type presents another difficulty with expert workers, who often use unusual methods for doing a difficult task. Helpers or beginners may agree on the correct answer without difficulty, while experts may approach a question by trying to find possible instances where one of the "confusion items" would be correct. It has been found necessary, therefore, except in written tests for special problem-solving abilities, to include in a set of Trade Questions only those questions which evoke an immediate answer. Questions which require much thought are discarded, because large numbers of experts apparently do not agree on the answers.

Questions should be selected on both a

qualitative and a quantitative basis. Questions that are too simple may arouse hostility. For instance, on a Coppersmith question: "When the hydraulic pump brings the die up to the pipe, what happens to the pipe at that spot?" 100 per cent of the experts, but only 20 per cent of control workers, gave the correct answer, "bends." The question was rejected because the experts considered the answer too obvious. Questions may also arouse hostility if they do not refer to the job for which the worker is applying. For this reason, a job summary is read to the applicant before the questions are asked. This summary lists each job duty covered by the set of questions. If the applicant does not claim to be able to perform all job duties, the test is not administered. In instances where large numbers of experts in an occupation perform certain limited job duties, separate forms of the test are provided for each set of duties. For instance, specific Diesel repairmen, such as a Buda Diesel or a G. M. C. Diesel Repairman, disliked or even refused to answer Diesel questions which applied to the engines in general. Seperate Diesel questions were therefore arranged for repairmen on each important make of Diesel. Information from the job analyses and from the answers to questions given by experts in the verification helps to determine the grouping of workers.

In the early stages of the program, the emphasis was on large numbers of workers. The emphasis today is on careful selection of workers before they are interviewed. This is facilitated by a very precise record of the experience and training of each individual worker. In the verification of a set of trade questions a check list, consisting of all duties of the job, is checked against the actual experience and training of the worker. These duties are then checked against the answers of a worker to the test questions. Often, workers misinterpret inquiries with respect to their experience, and a truer picture emerges after the questions are administered.

Since words alone could not specifically identify all knowledges and skills, Picture Trade Questions and Blueprint Reading Trade Questions were developed in 1942. The developmental procedures are the same as those for Oral Trade Questions, with the pictures or blueprints being secured in connection with the comprehensive occupational survey of the knowledge and skill factors of the job. Among the advantages of the use of pictures and blueprints are: they make trade questions more realistic and come closer to approximating actual shop conditions; they eliminate the necessity for a worker to vizualize the job task; they win the respect of the worker; questions may be more simply stated; and questions may be very specific without ambiguity. An experimental trial of Picture and Blueprint Reading Trade Questions in Employment Service Offices has indicated that they are satisfactory to both the interviewers and the applicants, according to the following quotations from reports: "The applicant seems to enjoy the informality of the questions." "Pictures are always interesting and the applicant can see what you are talking about." "Less time is consumed in administration."

Proficiency Utilization Tests were developed experimentally in 1943 and have not yet been standardized extensively. The procedures for development are basically the same as for the other tests since this test may be a compilation of two or more of the others. The major difference is adding extensive details of the knowledge and skill factors identified in the occupational survey and in the statistical analysis to secure weighted applicability to job duties.

Performance Trade Tests were standardized and introduced into Employment Service operations in 1935. The norms first derived were based on the distribution of scores made by a sample of applicants in the Employment Service. No attempt was made to provide separate norms for speed and accuracy; a letter grade of A, B, C, or D represented an interpretation for a combination of speed and accuracy. The actual use of such norms revealed, however, that greater practical value would be obtained from distinct norms for speed and accuracy. The new norms developed in 1939 were based on the scores made on the typing and dictation tests by successfully employed persons rather than on the scores made by job seekers, and separate norms were established for speed and accuracy. An individual's performance can thus be

interpreted as relatively speedy and accurate, relatively slow but accurate, or in terms of some other combination of speed and accuracy. Such norms meet the demands of most business offices. Certain employers, for example, would be willing to hire a typist whose performance was relatively slow if it were, at the same time, highly accurate.

The first Functional Proficiency Test was a spelling clerical test which used phonetically spelled words. This type of test was discontinued in 1942 when a new test was substituted which included some misspelled words. This test was developed in five stages; first, a list of commonly used words was selected; second, the list was administered to a sampling of employed clerical workers; third, the results of this preliminary verification were reviewed to select a list of satisfactory items arranged in order of difficulty; fourth, the revised list was sent to various field centers throughout the country where it was administered to a population of employed clerical workers; and fifth, the results of this final verification were reviewed to select the satisfactory items and a statistical analysis was made for determining norms. Functional Proficiency Tests on knowledge or skill factors of mechanical jobs were also developed in 1942, when a test for Micrometer Caliper Reading was standardized and introduced experimentally in a representative sample of Employment Service Offices. Reports indicate that it has proved valuable as a supplementary placement technique.

Anticipated Usefulness in the Future

Measurements of occupational proficiency should be increasingly significant because of changes in the labor force and because of the increased utilization of machines.

The increase in the number of persons employed to more than 50 million persons, and the increase in the number of persons trained for employment have produced vast changes in the labor force. Increased training has been brought about by the Pre-employment and Supplementary training and the Engineering-Science-Management programs of the U. S. Office of Education, as well as by the NYA out-of-school work program, the Training-Within-Industry, and the Apprenticeship programs of the War Manpower Commission. With more people working and more workers being trained, there are more opportunities for the measurement of occupational proficiency.

IX

Measuring Occupational Aptitudes

Appraising the validity of a battery experimentally rather than by means of judgment or intuition is the method used by the Division of Occupational Analysis and Manning Tables in developing aptitude-test batteries. The battery of tests chosen as a selection aid for an occupation is a combination of tests which has been determined, as a result of a study, to have a reasonably high multiple correlation with a criterion of job success.

Types of Tests

More than one hundred tests have been used experimentally. A few of the tests included in batteries were constructed by other workers and are available on the market, but most of them were constructed by the Division. The general functions which these tests measure include abilities such as verbal, number, space, perceptual, memory, reasoning, mechanical information, manual dexterity, and finger dexterity. Most of the tests are of

the paper-and-pencil type, but there are some apparatus tests designed to measure certain motor abilities—a peg board apparatus, finger dexterity apparatus, and tweezer dexterity apparatus.

In the choice and construction of tests one consideration was the judged or "face" validities of the tests for the occupation, as determined from the job analysis. Another criterion was the ease of administration in local United States Employment Service Offices. To satisfy this criterion the tests must be relatively short and readily administered by personnel with a limited amount of training. Since the basic individual tests were to be combined into batteries, items of a relatively homogeneous and specific type were included in each separate test. No omnibus type of test was constructed and no combination of sub-tests was developed to constitute a "general intelligence" test. In tests with items of varying difficulty, the items were arranged in order of difficulty. Since tests must be practical in application and suitable for wide-spread use, tests closely analogous to jobs were not developed; for example, tests such as the "Wisconsin miniature test for the engine lathe" and other miniature tests described by Hull.[1] Rather, the tests were of the type which he calls "tests of abstract traits" or which Viteles[2] calls the "analytic" type of test. Each may be considered to measure a rather narrow ability which may be required in various occupations.

Development of Batteries

An aptitude study has usually been undertaken as a result of a request made by a company to a local United States Employment Service Office of the War Manpower Commission for a selection device for workers for a specific job. Before making the actual study, a preliminary survey is conducted to determine whether useful results are likely to be obtained. A technician of the War Manpower Commission in cooperation with an official of the company makes the preliminary survey of the job and of the employees available for an experimental sample. If a union represents the workers, its cooperation also is sought. The steps ordinarily followed in an aptitude study are explained briefly in the following discussion:

1. *Job Analysis.*—A job analyst observes the job and writes a detailed description. A Personnel Data Form, a Worker Characteristics Form, and a Physical Demands Form are prepared as a part of the Job Analysis.

2. *Criterion.*—Production records, ratings, or some other measure of proficiency on the job for each employee are analyzed to determine their adequacy, and adequate criteria are selected.

3. *Experimental Battery.*—When an adequate criterion has been established, a number of tests suitable for measuring the abilities required to perform the job are selected for administration.

4. *Test Administration.*—The tests are administered to the group of employees for whom a comparable criterion or measure of proficiency on the job is available. The testing is done at the company's plant or offices by the staff of the War Manpower Commission. Testing time for the employee varies with the aptitude study and averages approximately two hours.

5. *Selection of an Experimental Sample.*—Tests may be administered to all the workers in the study in order to avoid personnel difficulties, but those subjects are discarded who are atypical with respect to age, education, or length of experience on the job.

6. *Determination of Test Battery for Use as Selection Aid.*—Those tests are chosen which are found most efficient in indicating the known ability of the employees—the tests on which the high scores tend to be made by superior employees and the low scores made by the less satisfactory employees. The best weighted combination of such tests constitutes the aptitude-test battery for the occupation.

7. *Check Study.*—The aptitude-test battery which has been developed from data for one sample of workers in an occupation is then verified on additional samples of workers in the same occupation in other plants.

8. *Follow-up Study.*—After an aptitude-test battery has been used as a selection device, follow-up data are collected, when possible, to determine the effectiveness of

[1] Clark L. Hull, *Aptitude Testing* (Yonkers, N. Y.: World Book Co., 1928).

[2] M. S. Viteles, *Industrial Psychology* (New York: W. W. Norton Co., 1932).

the battery in selecting the most satisfactory beginners for referral.

9. General Battery.—After data for several samples of workers in each of a number of related occupations have been collected, a general battery may be developed for a group or family of occupations.

Aptitude Tests for Selection

About 170 aptitude-test batteries have been developed which are applicable as selection aids for a large number of occupations. The first of these batteries was developed for use in selecting department store salespersons. This aptitude study laid the groundwork for many of the studies to follow; techniques were developed for determining an adequate criterion and for the treatment of test and criterion data. Then followed a series of studies of clerical occupations, from which there was developed not only a number of aptitude-test batteries for each specific clerical occupation, but also a general battery for a "family" of clerical occupations. With the advent of the war production program, aptitude-test batteries for occupations important in the war effort were developed, such as Explosive Operator, Aircraft Riveter, Arc Welder, Precision-Lens Grinder, Booster Inspector, Radio-Transmitter Assembler, Machinist, Sheet-Metal Worker, Power-Sewing Machine Operator, and Power-Press Operator.

Interviewers in local United States Employment Service Offices of the War Manpower Commission use these batteries in selecting the most satisfactory beginners to be referred for training on a job or in a training course. Before the introduction of tests in local offices, the testing personnel are trained in the administration of tests, and interviewers are trained in the interpretation of the test results.

A number of aptitude tests have been released to the War Department for their use in selection and in further experimental work.[3]

Results from the Aircraft Riveter Trainee Battery illustrate the effectiveness of an aptitude-test battery as a selection aid. The trainees with the highest third of scores on the battery set correctly an average of 190.2 rivets per 1,000 seconds, which was 26 per cent more than those in the lowest third of scores, who set correctly an average of 150.9 rivets per 1,000 seconds. This difference is statistically significant; the probability that it is a chance difference is less than one in a thousand.

The experimental sample on which this battery was standardized consisted of 51 men trainees in a VE-ND training course in San Diego, California. An experimental battery of 16 tests was administered to the sample.

Each test was then correlated with the measure of work proficiency (the criterion), to determine the validity of the tests for the occupation. The criterion consisted of the number of rivets set correctly on a timed work sample. The tests and the validities obtained are shown in Table II.

Table II
Validity of Various Tests for Aircraft Riveter Trainees
N = 51

Test	*Validity Coefficient*
Number Comparison	0.061
Name Comparison	−0.033
Substitution	0.336**
O'Rourke Vocabulary	−0.031
Number Writing	0.146
Arithmetic	0.092
Minnesota Paper Form Board	0.226*
Worker-Analysis Finger Dexterity Apparatus (Assembling) Part I	0.407†
Worker-Analysis Finger Dexterity Apparatus (Unassembling) Part II	0.462†
Worker-Analysis Tweezer Dexterity Apparatus	0.324*
Worker-Analysis Peg Board Apparatus Part I	0.551†
Motor Speed	0.104
Aiming	0.089
Eye-Hand Coordination	0.176
Figure-Copying	0.284*
Spatial	0.240*

* At least 1.65 times its standard error.
** At least 2.7 times its standard error.
† At least 3.0 times its standard error.

[3] Staff, Personnel Research Section, Classification and Replacement Branch, AGO, Personnel Research in the Army. IV. "The Selection of Radio-Telegraph Operators," *Psychological Bulletin* XL (1943), pp. 357–371.

The tests with significant validities were then considered for inclusion in the battery which was to be used as a selection aid. A multiple correlation technique was applied to these tests to determine the combination of tests having the highest degree of relationship with the criterion. This technique automatically excluded some tests; the Worker-Analysis Finger Dexterity Apparatus Part I, for instance, had a high validity, but its intercorrelation with Worker-Analysis Peg Board Apparatus Part I and Worker-Analysis Finger Dexterity Part II was so great that it added less to the validity of the battery than an unrelated test such as Figure-Copying.

The battery as finally developed consists of Worker-Analysis Peg Board Apparatus Part I, Worker-Analysis Finger Dexterity Apparatus Part II, and Figure-Copying. The combination of these three tests has a multiple correlation of 0.60 with the criterion.

Problems and Techniques

Many problems have been encountered in the conduct of aptitude studies—particularly problems related to sampling and to the development of adequate criteria. In the conduct of an aptitude study it is necessary to have as subjects a sample of workers who perform the same type of work, in order that the criterion data which are gathered will be comparable for the various workers. The group of workers employed in any one plant in a particular occupation is generally small. Moreover, if subjective ratings are used as a criterion, the problem arises of finding a group that is sufficiently well known by several raters so that they may evaluate each worker.

Composition of Samples.—If techniques are available for obtaining comparable criterion data, then smaller groups of subjects can be combined to constitute a larger sample. Here, for example, is a technique which was used for obtaining comparable data on a criterion element for trainees in a course in arc welding for shipbuilding. A "rating model" for "appearance" was developed, consisting of sample welds which the judges used in rating the appearance of the welds produced by the trainees as end results of work samples. A scale value was determined for each sample weld in the rating model, and by comparing a student's welding product with the samples in the rating model, the appropriate scale value could be assigned to the student's work. The standard of ratings remained the same although the ratings were made by different judges, and obviously such a model could be used by various judges in various places without any basic change in the standard.

In addition to smallness of samples, various factors may influence the composition of samples. A group of workers is selected for employment in accordance with principles, prejudices, and personnel practices of the person in charge of hiring. For example, some foremen or supervisors may desire workers with college training; others may prefer them without such training. The operation of these factors will of course affect the validity coefficients and other statistics determined in the course of an aptitude study.

One factor which markedly affects criterion measurements is the length of experience of the workers. The criterion data, when plotted against length of experience on the job, almost invariably show a rapid rise in proficiency in the earlier period on the job and then a slower rise as length of experience increases. One way of eliminating the experience effect is to select a group with a narrow range of experience. This procedure markedly reduces the size of the sample. Another procedure which does not reduce the size of the sample is to subtract from the criterion the effect of experience estimated by means of the regression of the criterion on experience.

Evaluating Job Performance.—Many jobs are complex and objective measurement of production is often impossible. Whether, in general, subjective ratings are inferior to the objective types of measurement is not certain. Subjective ratings are greatly affected by factors irrelevant to job proficiency. A rater is often influenced in his judgment by the appearance or personality of a worker even though these factors may not be important for the occupation in which he is engaged. It is also difficult to obtain a group of workers who are known well enough by several judges to enable them to rate the individuals.

Moreover, the group under a foreman is usually of very limited size.

Subjective ratings can be greatly improved if the raters are thoroughly familiar with the proficiency of each subject before making the ratings. No complexity of technique can compensate for a deficiency in judgment. On the other hand, if each rating is carefully considered, simpler rating techniques may often be used to advantage.

If the emphasis in subjective rating techniques is placed on knowledge and judgment on the part of the raters rather than on complexity of the method, rank order ratings can be as reliable and effective as the cumbersome paired comparison ratings or intricately weighted descriptive rating scales. At its best, the paired comparison method makes for finer discrimination within the central range, but such discrimination has only a slight effect on the validity coefficients and other statistical constants. The final interpretation of paired comparisons, in terms of linear scores based on a normal curve may result in distortion if the sample is not selected at random nor normally distributed.

Rank order ratings are also subject to this criticism. If it is known that the sample is highly selected and that the distribution of proficiency of the group deviates markedly from normality, it is desirable to use a rating other than rank order. One acceptable type of rating consists of setting up a series of several intervals or groups and allocating each subject to a group according to his estimated proficiency. Such a series of ratings may be considered to constitute a linear scale and no conversion to linear scores is necessary. This scale differs from the over-all rating on a descriptive rating scale only in the absence of graded descriptive labels.

Because the subjects may not be normally distributed, it has been found advisable to supplement rank order ratings with carefully defined over-all descriptive ratings. To avoid a piling-up of scores on either end of the scale, in the case of supervisors who are either very lenient or very severe, several blank intervals are left at each end of the scale for exceptional subjects, to prevent their submergence in the group which the rater would ordinarily consider excellent or unsatisfactory.

An additional check is to obtain "remarks" concerning the subjects, especially for the purpose of justifying exceptional scores. Exceptional scores affect the validities and other statistics far more than modal scores, and it is therefore usually advisable to evaluate them in the light of everything that is known about the subject.

It is fundamental that the raters should repeat the rating procedure after an interval of several days, as a check on their reliability.

Personal judgment is often a factor in many of the so-called objective techniques to the same extent as in the recognized subjective methods. The comparability of work performed on different models of machines in a plant, for instance, may have been established by the plant foreman from a sample of two or three workers, without equating for such differential factors as length of experience, age, and time of day. This equation, no matter how competent, is nevertheless subjective. The rating is probably less fallible if the subject is rated directly, rather than through the medium of performance objectively measured on a machine subjectively compared with other machines. In any event a subjective determination must always be made as to what constitutes a representative sampling of the duties of the job. The subjective assumptions implicit in objective techniques should always be examined.

Use of Tests in Allocation and Counseling

The coming of war diminished the need of tests for selection and a more pressing need arose for tests for the proper allocation of workers. As the labor market grew tighter with the expansion of the war production program, personnel officers in private industry became less interested in recruiting workers who had been tested for a specific job at the local Employment Service office. Often they sought merely to recruit workers—not workers for a specific job opening—since they had a sufficient number and variety of job openings to be able to place a worker in one job or another. This situation led to an interest in testing for the purpose of *allocating* the worker to the most suitable beginning job from among the openings in the plant.

As a result, some local offices began admin-

istering several aptitude-test batteries to each applicant, in order to effect the maximum utilization of available personnel. This procedure indicated a need for a test battery that could be scored for a large number of occupations.

Returning veterans comprise a new class of applicants for whom adequate placement is desirable, not only in the interest of more efficient production, but also in the furtherance of the rehabilitation program. Adequate counseling tools are needed to help veterans choose the most suitable fields of work, especially if incapacitated for their prewar jobs or if they lack work experience.

Specific test batteries for specific occupations are suitable as *selection* aids, since the objective is to choose, from among available applicants, those most likely to succeed in a specific job. The test battery for that specific job can then be administered to all available applicants. Specific test batteries are not so suitable for *counseling*, however, since the objective is to help the individual choose the field of work most suitable for him. The Division is therefore placing emphasis on the development of counseling aids.

Two types of counseling tools have recently been developed—a Counseling Battery and an Occupational Interest Questionnaire.

The Counseling Battery consists of those individual tests which have the greatest commonality among the numerous specific batteries. A single battery can thus be administered to all individuals and can be scored for a large number of occupations.

The interest questionnaire consists of items representing various types of occupational activities (not names of occupations). It is intended as a clinical tool. No method of scoring is provided; inspection of the answers provides clues for further questions to be asked in the counseling interview.

Research is also being conducted on the determination of basic factors or fundamental aptitudes underlying numerous tests which have been found to have predictive value for various types of occupational proficiency. A series of factor analysis studies of the tests is in progress. Factors which have been established on the basis of one completed study include a number factor, a perceptual factor, a spatial factor, a finger dexterity factor, and a manual dexterity factor. Other factors tentatively indicated on the basis of the other studies are verbal, reasoning, and motor speed. It is planned to construct a general battery for counseling which will measure these factors, and to standardize this battery for various groups of occupations.

X

Future Trends in Occupational Research

In tracing the work of the Division one observes that its program has been affected by national and international conditions. In the depression period there was a surplus of workers. During this period considerable data concerning occupations and worker characteristics were assembled in order to provide a foundation for further developments in both the application of the research findings and in further developmental work. Foundation funds and funds from the Work Projects Administration were available, and the program operated on a very broad scale.

In the defense period the work of the Division was immediately focused upon the preparation for war, and became concerned particularly with the problem of selection and transfer of workers in order that their capacities and skills could be utilized to the maximum as early as possible. During this period the Division also worked with the Armed Forces in their studies of occupations and skills, and in their application of research techniques and products which had been developed by the Division.

In the war period the work of the Division was focused on the practical problem of the effective utilization of workers in industry. This involved the use of occupational tools in upgrading, in-plant selection, in-plant classification, the determination of critical and essential jobs in industry, the development of criteria for occupational deferment, and preparation and use of Manning Tables. In this latter period the Division also continued to serve the offices of the United States Employment Service in their placement work, and intensified considerably its services to the Armed Forces and other government agencies.

With the close of the war, bringing extensive cut-backs and conversions, major emphasis in research and in the application of the research findings will be placed on the preparation of proper occupational information, tools, and techniques to aid in an orderly transfer of workers from military to civilian occupations and from civilian war occupations to peacetime occupations. Considerable emphasis will be given to the studies of jobs whereby handicapped veterans and war workers may be adequately adjusted. During this conversion and cut-back period, as during the war period, the pressure for the output of materials will be so great that long-run research will not be undertaken except in so far as the development of immediately available tools and techniques for practical application is a part of such a long-run program.

In the post-war period the greatest emphasis will doubtless again be placed on long-run research in the field of occupational adjustment. This will be best achieved by utilizing the resources of government, with financial assistance from private sources, to achieve flexibility.

The effect of technological change plus the fact that the Division has been able only to scratch the surface in studies of jobs as they now exist, means that considerable expansion may be necessary if the future studies are to meet the needs. This, of course, does not mean that the Division will conduct all the occupational research that will be undertaken. It is believed, however, that the work of the Division will be the focal point for clearance of information, so that duplication will be avoided. Through such a clearing house for all who are interested in occupational research and occupational adjustment, needed information about jobs, interests, skills, and abilities will be forthcoming at a much faster rate. It is probable also that after the war, with increased facilities of transportation and closer cooperation among governments, occupational adjustment will be discussed and explored among countries, and occupational research groups in various countries will exchange information, techniques, and research findings in order that all may profit by the work of others. Thus there may develop an international institute for occupational research, which will be the focal point and clearing house for studies in the field of occupational adjustment throughout the world.

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Editorial Comment

Occupationology—A New Science

THIS GENERATION is witnessing the emergence of a new field of scientific exploration which might be called Occupationology. The term may not be a particularly happy one, being compounded of roots from two different languages. Perhaps "Ergology," proposed by a European writer, is more acceptable from an etymological point of view since both its elements come from the Greek.

Whatever term be used, the fact is that the study of man's occupations is now proceeding along the lines followed in the study of rocks (petrology), plants (botany), animals (zoology). Each of these fields became marked off as a distinct scientific discipline when it became systematized as follows: First came collection of data. In botany lists were made of all forms of plant life. Then came classification. Plants with similar characteristics (for example, veined leaves) were grouped in one class; plants that flower were placed in another group and so on. A third stage common to all sciences is the accurate definition of each unit. Once these three steps have been taken, investigators in a scientific field can proceed to carry on advanced types of investigation; in botany, for example, experiments in cross-breeding, in the effect of certain soils on growth, the utilization of various plants in medicine, industry etc.

During the past few years the study of occupations has been passing through these preliminary stages. In 1934 The Occupational Analysis and Manning Tables Division of the United States Employment Service undertook to list the ways in which Americans earn a living. Their first list contained about 37,000 job names. The Division sifted these and, after eliminating duplicates, counted about 29,000, which designate about 18,000 jobs.

The next task was to classify occupations, that is, place all those with common characteristics in one group and all those with another set of characteristics in another group. When one undertakes to classify data, he must decide on a basis for classification. For the classification of occupations there are many bases that may be used: With intelligence as a base all occupations requiring a certain minimum degree of intelligence may be placed in one group. With earnings as a base, occupations in which the average earnings are $2,000 may be placed in one group, those with an average of $3,000 in another, etc. The basis used by the Division of Occupational Analysis and Manning Tables was uniqueness of operation performed in the occupation and characteristics required of the worker. On this basis the Division set up seven classes, with, of course, numerous subdivisions. Hereafter any occupation discovered or developed can be placed in this logical scheme.

In the process of isolating and classifying occupations it was necessary to define them just as scientists in other fields define a species of plant life or inorganic rock. Such definitions were published (1939) in the *Dictionary of Occupational Titles*, and as new occupations are isolated they will be similarly defined. Thus the *Dictionary* will require constant revision in order to reflect the growing nature of its subject matter.

The history of these developments is printed in the foregoing pages of this issue. We think that in years to come it will be regarded as the first textbook in occupationology.

But the three stages of collection of data, classification, and definition only lay the foundation. Now should come the erection of the structure. In other sciences this has taken the form of experimentation. In geology, an investigator subjects a species of rock to the action of various chemicals and thereby discovers new properties of the rock. In an

occupation the investigator may vary operations to discover the effects on output and on the workers. He may investigate the fatigue generated by occupational activity, first under one condition, then under another. A few such studies have been made, chiefly by psychologists and physiologists. This type of study has been referred to in the European literature as a technology to which the name "psychotechnique" has been applied.

But there are many approaches to the science of Occupationology. Logically it falls among the social sciences, since its subject-matter is man-at-work. Accordingly the approach of the social sciences may be used in building up the structure. Experiments can be made with varying rates and forms of wage-payment; with different ways of organizing tasks in production settings.

The possibilities that lie ahead almost stagger the imagination. Think of the agencies that will benefit from the application of the scientific method to the study of occupations. Vocational counselors naturally come first to the mind of the readers of this periodical. But employers are equally interested, for occupations (men-at-work) are their primary concern. Social-betterment agencies will profit, since they regard occupational activity as one of the most important phenomena of social life. Economists, both theoretical and practical, say that occupational activity is the mainspring of economic health. Theologians and moralists look on man's work as one way in which he glorifies his Creator, and so welcome any effort that dignifies work. Finally the workers themselves will gain.

While canvassing the implications of this new science we should not regard Occupationology as a field of *applied* science. Just as scientists study rocks purely for the sake of discovering new knowledge, so a scientist can study an occupation with no aim but that of "pure" research. The first example of this sort recorded in American literature is "Studies in the Physiology and Psychology of the Telegraphic Language," by Bryan and Harter (*Psychol. Rev.*, IV, 1897; VI, 1899). These investigators concluded, "in this direction lies a programme worth the labor of many good men." Undoubtedly, these investigators, writing nearly fifty years ago envisioned, as we do, future investigators attacking problems of occupational life in the same way as physicists study radium, as chemists study colloids. It is hoped that the Graduate Schools of universities will encourage doctors' theses in Occupationology. Such a thesis accepted by one university is: "A Functional Pattern Technique for Classification of Jobs," by Edwin W. Davis, Teachers College, Columbia University, Contributions to Education, No. 844 (1942). Even though hundreds of such theses are written in the next century we shall not complete the structure of knowledge; for science, like art, is slow; its facts, which must be indisputably established, are accumulated only through toil and sweat. But a firm foundation is now laid by the pioneers whose achievements are recorded in this issue. We shall expect the investigators of the future to erect the superstructure.—H. D. K.

Association Activities

Reports from Officers, Trustees, Branches, Committees, and Members of N.V.G.A.

Second Regional Conference in New York Area

"Post-war Planning and Vocational Guidance" was the theme of a conference held at the Hotel Pennsylvania, New York City, February 22. More than 350 persons attended this second regional conference sponsored by the Regional Federation of Metropolitan Branches, NVGA, and the Welfare Council of New York City Section on Employment and Vocational Guidance. Educators and representatives from public and private agencies were included in the roster of speakers.

The war has produced the greatest labor migration in our history, distorting the pattern of employment and population distribution, according to A. F. Hinrichs, who is Acting Commissioner of Labor Statistics, U. S. Department of Labor. Dr. Hinrichs attempted to forecast employment trends of the post-war period. It is desirable in the post-war period to have voluntary withdrawals from the labor market, and youth still in school should be encouraged to stay there. The educational casualties are as serious in war as the physical. Accordingly, counselors will have to advise many out-of-school adults; it will be the school's obligation to adjust its calendars and curricula to meet the needs of adults demobilized from the Armed Forces and from industry.

Alexander Stoddard, Superintendent of Schools, Philadelphia, reminded his colleagues that the school has learned precious lessons during the emergency. They should retain the flexibility in their training programs; they should continue cooperation with industry and labor and play a more dynamic part in the community.

Business and labor were represented by Stanley A. Holme and Laurence Brogan, respectively. Mr. Holme outlined the program of the Committee for Economic Development (Occupations, March, 1944, p. 368); and Mr. Grogan of the CIO asked that labor more often be given a place on community committees in order that it may share in the planning for post-war occupational adjustment.

How veterans are helped to adjust to civilian life was described by Col. John N. Andrews, Post-war Activities Officer, National Selective Service. A program is already being tried in seven cities—New Haven, Philadelphia, St. Louis, Houston, Denver, Los Angeles, and Minneapolis—in which a special service for veterans is operated by the Veterans Employment Service as part of USES. All veterans on their first visit to these offices are routed immediately to personnel designated to give service to veterans. Those desiring immediate placement will see the veterans placement specialist; Selective Service representatives will aid those desiring assistance in obtaining re-employment in their former jobs. The counseling section will serve others.

The counseling service will assist veterans, on request, in making an occupational choice; analyze information provided by the Armed Forces as to their Service training and experience, and supply information on job opportunities and requirements in both local and other areas. Representatives of local employers and labor officials will work with the placement specialists and the counselors for the physically handicapped on placement problems.

Col. Andrews cited several interesting case histories: An older man discharged from the Army because of his nervous temperament did not want to return to his former job as salesman. In the Army he had become an expert automotive mechanic and he is now

happily adjusted to a job in an aircraft plant. There was the sailor whose hearing was seriously impaired because of Service injuries. After careful counseling, training, and placement he is doing an important war job as a meteorologist.

Anna M. Rosenberg made an eloquent plea for expert guidance facilities and the cooperation of all community resources, public and private, in the post-war adjustment of veterans and workers. Mrs. Rosenberg, who is Director, Region II of the War Manpower Commission, pointed out that youth returning without pre-war vocational experience will be impatient of try-out or exploratory jobs in which young workers formerly tried to discover for themselves the most satisfactory vocational field.

Following the luncheon, Eveline M. Burns, Consultant, National Planning Association, gave a brilliant résumé of the day's discussions. She asked pointedly what we as citizens and as professional people were prepared to do. She urged that we adopt a realistic attitude, secure exact information on what is being done locally and nationally, that we make the objectives of the peace as great as those of the war.

This regional conference in a non-convention year supplied professional inspiration to a considerable area. NVGA Branches in the Metropolitan Federation are: New York City, Teachers College, Columbia University, New York University, Long Island, Westchester, Mid-Hudson, Rockland County, and New Jersey. Convention Chairman was Helen R. Smith, Vocational Advisory Service, New York City.—G. W.

Chicago Holds Regional Conference

Five states were represented at the successful regional conference held in Chicago, February 12. The general theme, "Facing Personnel Needs in the Months Ahead," was presented in three sections dealing with specific problems related to returning service men and women, displaced war workers, and students. Preceding the sectional meetings an over-all picture of the problem was given by R. C. Rosecrance, Professor of Education, Northwestern University. Sectional Chairmen were Edgar T. Stephens, Executive Secretary, Illinois Association for the Crippled; Ruth I. Stone, Industrial Relations Branch, Western Electric Company; Clifford Erickson, Associate Professor of Education, Northwestern University. Each section had a panel of consultants representing the schools, industry, government agencies, and community services.

At the luncheon session, section chairmen summarized their meetings, and Howard Y. McClusky of the University of Michigan, formerly of the American Youth Commission, spoke on "Post-war Education and Rehabilitation."

New Jersey Spring Conference

Collaborating with the School of Education, Rutgers University, the Guidance and Personnel Association of New Jersey held a conference at New Brunswick, April 1. At the first general session this program was scheduled: "Retraining for Peacetime Production," John A. McCarthy, Assistant Commissioner of Education, New Jersey, and President, American Vocational Association; "Rehabilitation of War Veterans with Service Connected Disabilities," F. L. Kane, Vocational Rehabilitation Officer, Veterans Administration; "More than a Job," Captain Gill Robb Wilson, Aviation Editor, *New York Herald Tribune*. Chairman was New Jersey Commissioner of Education, John H. Bosshart.

At the luncheon Ambrose Caliver, Senior Specialist in the Education of Negroes, U. S. Office of Education, spoke on "The Implication of Certain Wartime Facts for the Post-war Guidance of Negroes."

Following the luncheon, discussion groups considered these topics: Guidance of high school pupils in intra-mural problems; youth employment problems; guidance, rehabilitation, and training for service terminated men and women; readjustment of the industrial worker.

The conference closed with summary reports from the discussion groups. Chairman of the Conference Committee was C.E. Partch, Dean, School of Education, Rutgers University. Those who registered will later receive the published proceedings.

N.V.G.A.'s Inter-American Program

NVGA's Committee on Inter-American Program, Margaret E. Bennett, Chairman, has made a significant contribution in the recently released Spanish and Portuguese editions of a monograph on vocational guidance. Prepared by the Committee, they were printed and distributed by the Pan American Union to meet the increasing demand in Latin America for information about vocational guidance in the United States. The series will also include a translation into French.

The contents of the monograph is as follows: origin and development of vocational guidance in the United States; principles and practices; organization and administration; training and qualifications for counselors; the contribution of NVGA and OCCUPATIONS; and a selected bibliography.

The very lively interest shown by Latin Americans is reflected in letters received in answer to the OCCUPATIONS editorial, "The Americas United for Vocational Guidance" (OCCUPATIONS, Nov., 1942, p. 237; Feb., 1943, p. 495).

CGPA Board Meeting

The Board of Representatives of the Council of Guidance and Personnel Associations met in New York City on March 2, 1944. NVGA was represented by M. R. Trabue, H. D. Kitson, and Christine Melcher. Reports of the Secretary and the Treasurer were read and approved. Elsie Smithies reported on the work of her special committee which has been investigating the question of the amount of dues paid by member organizations. It was decided to ask organizations to pay fees ranging from $15 to $50, for the year 1943–1944, depending on the size and nature of the group.

On recommendation of the Membership Committee, the National Association of Deans of Women and Advisers to Girls in Negro Schools was invited to become a member of the Council.

A committee was appointed to carry out plans for a series of regional conferences to be held January and February, 1945, in New York City, Atlanta, Chicago, Denver, and San Francisco. Each member organization will hold its own meetings and one or more general sessions will be scheduled. NVGA will appoint regional chairmen to collaborate in developing the program in each area listed above.

The next meeting of the Board of Representatives is to be November 16, 1944.

Members Urged to Lead in Community Guidance Efforts

The Board felt that a message was imperative from that body to the members of the constituent organizations regarding the desirability of participation in community planning for guidance services in the post-war era. Professionally competent practitioners of guidance should be among the first to call meetings of planning groups. We should be interested in so doing not only because it should be our desire to see that any services given as guidance are as adequate and any persons known as counselors are as able as possible, but because this is our opportunity to make a patriotic contribution, our opportunity to serve. This report prepared at the behest of the Board of Representatives is sent to you with the hope that many of you individually will initiate community planning groups, will work actively as members of such groups and will assist in the setting of standards and the training of counselors.

(Ed. Note—The report, containing about 3,000 words, is composed chiefly of materials already published in OCCUPATIONS and accordingly is not being repeated in this journal. It is, however, being published in journals maintained by other organizations in the Council.)

Branch News

Canada

Unanimously members of the Ontario Vocational Guidance Association voted to change the name to Canadian Vocational Guidance Association. Since the membership had never been limited to Ontario and since interest is growing rapidly in Canada, this change will facilitate the forming of new branches throughout the Dominion. There

are now two Branches—Hamilton, which for some years has been holding monthly meetings, and Toronto, which reorganized February 24. The annual meeting of the Canadian Branch is scheduled for April 12, in Toronto. Guest speaker is Floyd Cromwell, Supervisor, Occupational Information and Guidance, Maryland.

Connecticut

A panel discussion of part-time work of high school students was broadcast from Stamford, March 6. On the panel were Dorothy Lewis, National Association of Broadcasters; Charles Olson, Head of Commercial Department, Stamford High School; Roland C. Truxell, Personnel Department, Sears Roebuck; Mrs. Arthur Ransahoff Stamford; Eric Malquist, Principal, Norwalk High School; and local youth, working full and part-time. The moderator was Stanley High and the program chairman, Edith Lawton, Darien High School.

District of Columbia

A symposium on post-war jobs was presented at the meeting, February 29, by these speakers: Harold Goldstein, U. S. Department of Labor; Elizabeth Cosgrove, U. S. Civil Service; and Fred Morrow, Chesapeake & Potomac Telephone Co.

Atlanta

On April 14 the Branch will be co-sponsor with the Georgia Vocational Association of a breakfast, during the annual convention of the Georgia Educational Association. Guest speaker at the luncheon meeting on March 15 was Ethel M. Wood, of England. During the first World War Mrs. Wood was made a Companion of the Order of the British Empire for her work as secretary of the London War Pensions Committee. At that time she was the British representative in the United States at the conference on the treatment of disabled men and their adjustment to civilian life. John W. Studebaker, U. S. Commissioner of Education, spoke at the luncheon on February 19.

Maryland

Col. John N. Andrews, Re-employment Division, Selective Service, spoke on "Vocational Readjustment of Returning Veterans" at the meeting, March 21. Rehabilitation, training, employment, and other factors leading to readjustment in the economic and social life of the community were discussed. Because this topic is of universal interest to community leaders, invitations were sent to representatives of public and private agencies, civic and professional organizations, and service clubs.

Greater Boston

Overcoming barriers to the post-war employment of youth was the topic featured at the dinner meeting, March 8. Statistical background was furnished by Roswell F. Phelps, Director of Statistics, Massachusetts Department of Labor and Industries. Superintendent Calvin E. Wilcox of the Dedham Public Schools spoke on work-experience programs, and Principal Mayo Magoon of the Framingham High School discussed how the high school might prepare youth for a competive labor market. General discussion from the floor rounded out the program.

Merrimack Valley

The general theme for 1944, "Post-war Adjustment of Military and Civilian Personnel," has been broken down into two topics: "Economic Factors and Reconversion" and "Governmental Agencies and Adjustment Services." The first was covered at a dinner meeting, February 28; the second is scheduled for May 8. Following is the program for the February meeting: "Jobs for All Who Want to Work," James W. Culliton, Director, Massachusetts Committee on Post-war Readjustment; "Employment: Key to the Post-war Future," Carl D. Smith, President, Babson Institute Committee for Economic Development; "Rehabilitation, a Conservation of Human Resources," Kenneth N. Palmer, Director, Rehabilitation Center, Boston.

Buffalo

Chancellor Samuel Paul Capen of the University of Buffalo spoke on "Keeping the Liberal in Education," at the meeting, March 24.

Long Island

Robert Hoppock, Professor of Education and Chairman, Department of Guidance and

Personnel Administration, New York University, led the discussion at the dinner meeting, March 23. Panel members from Long Island schools considered practical aspects of vocational guidance.

Mohawk Valley, N. Y.

A display of occupational information—monographs, pamphlets, and books—was exhibited at the dinner meeting, March 2. The practical aspects of dissemination of information and pre-induction training were discussed by the following panel: Jo Baker, Mrs. Frank Quinn, Harold Watson, Ruth Georg, and Mr. Piester.

New York City

A progress report from the Speakers Bureau reveals that from September, 1943, to January, 1944, nine members cooperated with the Committee in arranging programs featuring vocational problems. (OCCUPATIONS, Oct., 1943, p. 56.) The Committee plans to expand this service, offering it to other agencies besides schools.

Rochester, N. Y.

Schools should offer youth more opportunities to learn Spanish, Portuguese, Russian, and salesmanship to prepare them for the increase in our export business which may follow the war, declared Lee McCanne at the meeting, February 10. Mr. McCanne, Secretary of Stromberg Carlson Company, spoke on "Post-war Planning." He pointed out that to absorb the 10 million men who it is estimated will be in the Armed Forces at the end of the war we will need an employment of at least 57 million. For Rochester this would mean boosting present production 18 per cent. Through post-war planning programs already set up, local industries believe they can increase production 24 per cent.

Cincinnati

"The Young Worker and Organized Labor" was discussed at the meeting, March 8, by the following panel: G. V. Bidinger, editorial writer, *Cincinnati Post;* C. F. Mugridge, Director of Labor Relations, Kroger Grocery and Baking Co.; and Abe Rosenfield, formerly with the National Labor Relations Board.

Northeastern Ohio

"Occupational Analysis as an Approach to Vocational Guidance and Re-employment" was the theme of the dinner meeting, February 24. Guest speaker was Elder R. Herring, Chief, Personnel and Training Section, War Manpower Commission.

Philadelphia and Vicinity

A dinner meeting was scheduled for March 23, in connection with Schoolmen's Week at the University of Pennsylvania. Guest speaker was Hertha Kraus, Associate Professor of Social Economy and Social Research, Bryn Mawr College, who talked on "Meeting Tensions in Human Relations."

Seattle

Rehabilitation services for returning veterans was the theme of the February meeting, attended by representatives from the Veterans Administration; State Department of Vocational Education, Rehabilitation Division; and Veterans Employment Representatives, USES.

Canadian Vocational Guidance Centre

The Centre continues to aid in developing sound programs in the schools. (OCCUPATIONS, Dec., 1943, p. 206.) Among its publications are Occupational Monographs, Occupations Course Text-Notebooks, Cumulative Record Folders, Occupational Information Filing Folders, and Intelligence Indicator. Busy counselors are kept up to date through the Occupational Information Service and the Teacher-Counselor Mailing Service. The Centre is a division of the National Committee for Mental Hygiene and operates on a non-profit basis.

More Notes on Community Planning

The need of a correlated community program in dealing with the demobilization and readjustment of veterans and the special role of the libraries were discussed at a regional institute held March 4–5, in Chicago. Sponsored by the Illinois, Indiana, and Wisconsin Library Associations, at the request of the American Library Association, the institute is the first of a series of regional meetings to be held throughout the country. Various agen-

cies were represented—the library, Selective Service, War Manpower Commission, labor, industry, schools, and colleges.

Specifically libraries were urged to serve as an information and materials center for other agencies and individuals. There should be a quick information file of data about community agencies and their services. Vocational information should be centered in a shelf, alcove, or room. It should be adapted to local needs. Use increasingly audio-visual materials; set up a film lending service. Publicize library facilities at labor and service club meetings. Be prepared to help the individual reader make the most effective use of informational material available.

"Education and Training for Demobilized Service Personnel" and "Retraining War Workers for Peacetime Activities," recently issued by the Committee on Education of the U. S. Chamber of Commerce, also stress the necessity of integrated community action in order to avoid duplication. Among the specific recommendations made for the demobilization and adjustment of veterans: no new federal agency should be established; appropriated funds should be administered by the Veterans Administration; details of education and training should be worked out with the U. S. Office of Education and state educational authorities; in operation the program should be decentralized; state educational authorities should determine the need for supplementary educational and vocational counseling.

Who's Who and Where

MARGUERITE W. ZAPOLEON, who has been in the War Department, has joined the staff of the Women's Bureau, U. S. Department of Labor.

FRANCIS G. CORNELL succeeds the late Giles M. Ruch as Chief, Research and Statistical Service, Vocational Education Division, U. S. Office of Education. For the past three years Dr. Cornell has been Assistant Director of Vocational Training for War Production Workers, U. S. Office of Education, in charge of research and statistics. With Paul Mort and others he is author of *Guide for Appraisal of School Systems, American Schools in Transition.* He was formerly principal, Park School, Buffalo; research associate in school administration, Teachers College, Columbia University; and director of research, secondary education, public schools, Harrisburg, Pennsylvania.

FRED PATTON, formerly Director of Guidance, High School, Fort Smith, Arkansas; and President, Arkansas Branch, NVGA, has accepted a position with the Beech Aircraft Corporation, Wichita, Kansas.

EARLE E. EMME has been elected Dean of Dakota Wesleyan University and Director of Personnel. He has been for ten years affiliated with Morningside College, Sioux City, Iowa, as Chairman of Psychology and Guidance and Director of the Downtown Division of the college.

EUGENE DILS, President of the Seattle Branch, has resigned from the Seattle Public School system to become Field Supervisor in Charge of Special Services, USES, Seattle.

Presenting a New Life Member

From Margaret E. Bennett comes this message: "I wish to express my heartfelt appreciation of the Life Membership in NVGA conferred by friends in the Association. Its presentation at a dinner meeting in Pasadena, March 30, was a complete and delightful surprise. The framed certificate will be a most prized possession symbolizing joy and satisfaction in cooperative work and fine friendships and the hope for their lifelong continuance in an ever growing Association."

The feature Washington Flashes, omitted in this special issue, will be resumed in May OCCUPATIONS.

Books Reviewed

Reviews of Recent Publications . . . By Various Contributors

VOCATIONAL INTERESTS OF MEN AND WOMEN. By Edward K. Strong, Jr. Stanford University, California, Stanford University Press, 1943. Pp. 746. $6.50.

Dr. Strong's work in the measurement of vocational interests has for nearly twenty years been a landmark in the field of vocational testing, and a guidepost for vocational counselors. Any competent publication which throws light on the nature of vocational interests and on the use of Strong's Blank is therefore likely to be of considerable interest to all counselors who are alert for opportunities to improve their insight and techniques. When the publication is by Dr. Strong himself, when it deals in detail with the numerous investigations of the nature and measurement of interests which have been completed during the past twenty years, and when it is written in a clear and easily read style, it becomes a "must" book for every vocational counselor's library.

In this one publication Dr. Strong discusses the findings of two decades of research, involving the expenditure of well over $50,000. It is obviously impossible, in a brief review, to discuss the book in detail. Comments on a few points which may be helpful to readers are, however, in order.

The organization of the book seems confused when the table of contents is first studied. This is primarily a typographical problem, however, resulting from the number of subheadings. These make the book more easily used, and need not discourage the reader. Although full of tables and figures, the material is clearly and interestingly presented. Any college graduate should be able to follow the argument and understand the conclusions. Certainly anyone qualified to use Strong's Interest Blank should be able to read the book with ease, and everyone who uses the test or any other interest test should read it carefully and with considerable profit.

Although Dr. Strong's treatment of interest testing is broad and by no means limited to his own work, there are some important omissions. For example, no mention is made of Greene's Michigan Vocabulary Profile Test, or of Cardall's Test of Primary Business Interests. But such omissions are relatively infrequent.

Dr. Strong brings out some hitherto neglected facts on the nature of interests. One of these is the basic similarity of interests regardless of occupation, age, or sex; group differences are important, but limited in range. Another is the importance of occupational or socio-economic level, and the possibility of measuring vocational interests at the lower levels by taking the level into account.

The author is to be congratulated on the thoroughness with which he has studied his test and the factors which it measures, and on the clarity and detail in which he presents his findings. It is a sign of maturity in vocational testing that such books are beginning to appear.—DONALD E. SUPER, *Captain, Air Corps, Psychological Research Unit No. 1, Maxwell Field, Alabama.*

YOU AND YOUR FUTURE JOB. By William G. Campbell and James H. Bedford. Los Angeles, Society for Occupational Research, Ltd., 1944. Pp. 368.

You and Your Future Job is a collection of brief descriptions of individual jobs arranged, for the most part, in chapters according to Census groups. This reference book might be used as a high school text or with young adults about to choose a job. This book is a good choice for limited budgets because it covers so many different occupations.

Each chapter describes from twelve to fifteen jobs, including occupations about which pupils are likely to ask, and the final chapter is on Landing the Job. Illustrations are realistic photographs of young workers.

Facts are up to date; information likely to become obsolete has apparently been avoided. For example, though the Navy's lowered

wartime age requirements are mentioned, the peacetime requirements for enlistment are stressed. In all occupational groups, the humbler jobs receive as much attention as the more romantic ones, which are gently deglamorized.

Though the material is factual and the coverage wide (more than 200 jobs in an 8-page table of contents), the grouping could have been more logical. For example, we find the petroleum engineer in Chapter III, Industry and the Trades, while under College and the Professions, Chapter XV, we find the mechanical, the electrical, and the mining engineer. Air hostesses are not listed with their co-workers in Transporation, but with Opportunities for Women.

Well organized are the chapters on Agriculture, Building and Construction, Health and Healing, Clerical and Financial Service, Domestic and Personal Service, Transportation and Communication, Entertainment and Writing, Arts and Crafts, Merchandising and Selling, and Government (civil) Service. Armed services are described in the chapter on Protection and Defense, which includes fire fighters, judges, and G-men. There are several interesting chapters which include a potpourri of miscellaneous jobs.

As an individual occupational study, each job description could hardly stand alone. Not the same facts about each job are given, no uniform outline is followed. Some include rates of pay; others do not. Some include hazards, advantages, disadvantages, lines of promotion, related opportunities, and other information; but basic data, such as the limited number of openings in some fields, and the many possibilities in others, are not always given. Every job description covers duties and qualifications; some include nothing else. However, each brief job survey does not pretend to be exhaustive.

Unique features are the index-like table of contents (it has a good index too), its clear-cut chapter organization (though a few occupations might have been placed in other chapters), and its stress of general living and working conditions in each large field.

At the end of each chapter are excellent suggestions for further investigation, which requires original thinking and real research.

Bibliographies follow all chapters, and include "old stand-bys" as well as trade papers, novels, autobiographies, and leaflets. An alert pupil, following these leads, will find himself only beginning to learn about occupations when he reads this book. We suspect that this was the authors' aim.—MARION W. MCLAUGHLIN, *Vocational Counselor, Cincinnati Public Schools.*

HANDLING PERSONALITY ADJUSTMENT IN INDUSTRY. By Robert N. McMurray. New York, Harper's. Pp. 297. $3.00.

While this book is addressed primarily to business managers, it will be of value to all who are interested in the application of "the sciences of psychology and psychiatry" to the adjustment of personality in industry. The author stresses the application of qualitative, subjective, and clinical techniques to this adjustment, rather than the more frequently used quantitative techniques.

The subject matter is divided into four parts: Labor Problems, Problem Employees, Selection Problems, and Training Problems.

In Part I there is an excellent chapter on the causes of employee dissatisfaction. It is impartial in its finding that not all dissatisfaction is due only to the employee or only to the employer—each tends to distrust the other. Suggestions are made for discovering the real causes of dissatisfaction and recommendations are made for building good-will and morale. The reviewer does not approve all the recommendations, as, for example, the proposal that aggressiveness toward the employer might be displaced by giving an employee, as a reward, the privilege of driving a nail in the eye of an effigy of Hitler.

Part II treats of "vocational and emotional maladjustments" of problem employees. Five major patterns are considered: preoccupation with self, attacks on others, attacks on self, passivity, compensation for insecurities and inadequacies. Examples are given and recommendations are made for handling these problems.

Part III discusses selection problems. Some of these grow out of the attitudes of those who are responsible for making selections. Personality has so much to do with the success or failure of the worker that a great deal of effort should be exerted to explore the personality of the applicant. The author has devised standardized forms for interviews, with explanations for their use at the office and in the home. In the reviewer's opinion,

these forms are practical only for the higher grade employees, because of the amount of time and effort required to secure and digest the information outlined. The author does not go into the problem of relating the job to the employee.

Part IV is concerned with training problems —motivating acceptance of the training, altering attitudes and behavior, training the interviewer. A manual is presented on the theory of personality from the psychoanalytical viewpoint. The author's Freudian psychology permeates the book.—CARLETON TAYLOR, *Building and Grounds Department, Columbia University.*

CAREERS FOR GIRLS IN SCIENCE AND ENGINEERING. By Evelyn Steele. New York, E. P. Dutton, 1943. Pp. 181. $2.50.

Careers for Girls in Science and Engineering should prove fascinating reading for boys as well as girls. Nine different scientific fields are analyzed in detail, with the background of the development of each sketched. The general occupational field is broken down into its numerous subdivisions, with names and information about all the related jobs, and their vocational possibilities for girls and women. Counselors who have felt the need of accurate and carefully compiled information about scientific and engineering occupations will find this book very inspiring.

Miss Steele has an energetic, picturesque style which carries the reader along on the crest of her enthusiasm. She not only spreads out before the reader a lavish display of information; she also enlivens it with the life stories of women who have been conspicuously successful in the occupations.

Photographs show girls occupied with a variety of scientific operations and experiments. If a criticism might be made it would be that there is a lack of arrangement of type jobs for quick and easy reference. The index, however, is excellent, detailed and accurate.

Since the emphasis is placed entirely on real and potential openings for girls now and during the war, and the present need for girls in the fields usually open only to men, the book has the limitation of being helpful now, but with less certainty after the war.

The comment of a high school boy is pertinent. Said he, "I don't see why they don't let girls do these things all the time." That perhaps sums up the situation. In the final analysis all this interesting and readable information applies to boys as well as to girls, and the book must be regarded as period material as far as girls alone are concerned.—CELIA D. SHELTON, *Coordinator and Counselor, Edison Vocational School, Seattle, Wash.*

EMPLOYEE EVALUATION MANUAL FOR INTERVIEWERS. By Richard A. Fear and Byron Jordan. New York, The Psychological Corporation, 1943. Pp. 39. $1.75.

This manual, to be used in conjunction with a rating scale interview blank, gives in compact, logical form the a-b-c's of job interviewing. Chapter headings include work history, training and personal history, with paragraph analysis of pertinent items under each. The authors "do not profess to present anything profound or, in fact, new about interviewing," they have "simply gathered together some common-sense principles which have been found helpful in determining an applicant's fitness for a job and organized them in a manner suitable for industrial use." This seems an understatement, however, since this brief manual might well serve as required reading for new interviewers and, no doubt, will also prove very helpful as a reminder of pertinent items to seasoned interviewers. The manual contains three samples "evaluation forms" properly filled out as illustrations of actual work in the field. The manual seems to be sound psychologically and is undoubtedly based on considerable interview experienced by the two authors.—MARTIN L. REYMERT, *Director, Laboratory for Child Research, Mooseheart, Illinois.*

YOUNG MEN AND MACHINES. By Raymond F. Yates. New York, Dodd, Mead & Company, 1944. Pp. 196. $2.00.

Anyone attempting to present worth-while occupational information under the abnormal conditions prevailing today is beset by a multitude of difficulties. Every statement concerning employment possibilities and wage scales must be modified and qualified as to

time, place, and condition if it is to have any validity or a semblance of truth by the time it reaches the public.

Mr. Yates, while not overlooking technological advances due to the present war, has very largely ignored its effect on industry, and assumed a post-war return to industrial employment conditions approximating normal pre-war conditions. Having made this assumption, he presents the occupational opportunities of the machine tool and mass production industries in a thoroughly readable and interesting way. Beginning with a brief history of the development of machine tools and a description of their basic forms and principles, he touches on the newer and more promising developments in mass production.

While giving due consideration to the necessity for automatic machines and quantity production methods, the author rightly emphasizes the importance of the machine designer, general machinist, tool-maker, die-sinker, and the other skilled occupations involved in preparing for quantity production. He attempts with considerable success to give an accurate picture of the skills involved, the training and personal qualifications necessary for success in the more important vocations in the fields covered.

Considerable space is given to apprenticeship and corporation training programs and the opportunities they offer. This reader felt that the very detailed description of one or two of these programs is hardly justified by the small proportion of prospective readers who will be able to take advantage of them. Otherwise, he found little to criticize in the book. It combines accuracy and objectiveness with a thoroughly readable style, and is a valuable addition to the library of occupational information.—LEE M. KLINEFELTER, *Director of Vocational Education, Norfolk Division, College of William and Mary, V.P.I.*

MOVE UP IN YOUR JOB. By Clark C. Stockford, New York, Funk & Wagnalls Co., 1943. Pp. 238. $2.00.

This is a success book, written in distinctly didactic mood. It lays great stress on self-analysis and a rigid self-discipline to attain the conventional virtues of initiative, concentration, sense of responsibility, and the like. Dragged out into 238 pages is some good material which might have been useful and much pleasanter reading if concentrated into a booklet of perhaps eighty pages.

The author is evidently not impressed by the differences in intelligence quotients nor by personal variation in vocational aptitude, nor does he seem to recognize that there are groupings of occupations into which many a person may or may not fit. Enthusiasm, for example, appears to him to be a quality that can be summoned whether or not the activity has any appeal to the deeper interests and abilities.

Carefully selected portions of the book might make good assignments for discussion in distributive education classes or in the high school commercial courses. Some of the stories of job getting and promotion are excellent in themselves but need to be separated from the ever-present preachment.

On the whole the book is sincerely written but sounds like the work of a care-worn executive, overconscious of the frailties of his employees. All the unpleasant things the author says about human nature may be true, but there still remains the question whether the medicine of eternal self-consciousness is quite the needed remedy.—C. C. ROBINSON, *State Department of Education, Augusta, Maine.*

Publications Received

Cartwright, Morse A. *Marching Home—Educational and Social Adjustment after the War.* New York, Institute of Adult Education. New York, Bureau of Publications, Teachers College, Columbia University, 1944. Pp. 44. $.25. Quantity rates.

Post-war training and occupational adjustment of veterans and war workers are considered in Part I of this Bulletin, while Part II illustrates the scope and types of training service that may be offered by universities and training institutions at the graduate level, with the program of Teachers College cited as an illustration. In the maze of government agencies authorized to aid in this post-war adjustment, the trail ultimately leads to the community, the place the veteran or war worker calls "home." "The kind of leaders, counselors, teachers, administrators he meets in his home community are important to him." He is entitled to the best professional services. But since trained personnel in sufficient numbers are not available, the first great need is for training

facilities at a graduate level. Training programs should be relatively brief, highly concentrated and designed to improve the techniques of former workers, semi-professionals, and volunteers.

Planning Your Professional Career. Optometry. American Optometric Association, 518 Wilmac Bldg., Minneapolis, Minn. Free.

A little booklet giving information in simple form, for students, supplementing the monograph, "Optometry," for counselors, issued also by the Association.

Blackburn, Alan R., Athearn, Clarence R., and Shoesmith, Marion. *Report of the Vocational Training and Guidance Program of the New York Institute for the Education of the Blind.* New York Institute for the Education of the Blind, 999 Pelham Parkway, New York 67, N. Y., 1943. Pp. 104.

This new, revised program of the Institute aims to plan the curriculum for each vocational pupil so that academic studies, school activities, health education form an integrated plan for his four years of high school. The program provides a continuous educational and vocational guidance service in special classes and individual interviews and is concerned with problems of placement of graduates. The Guidance and Diagnostic Clinic is vital to the program. At the clinic are testing equipment, actual jobs from normal industry set up for try-out, practice business office with standard equipment. In the apprenticeship division of Junior Shops, sheltered industries on a small scale are installed. Among the departments of the clinic are educational and vocational guidance, vocational committee, and vocational advisory committee. The library contains vocational information but vocational material in braille is badly needed.

Training Teamwork. Apprentice-Training Service, Bureau of Training, War Manpower Commission, Washington, D. C. Pp. 12. Free.

A pamphlet describing how management and labor have worked together in joint-in-plant training committees to deal specifically with apprenticeship as well as short-term training programs. This collaboration is exemplified by a description of joint committees at Manitowoc Shipbuilding Corporation, Skagit Steel and Iron Works, General Mills, Inc., and Belmont Radio Corporation. A list of bulletins and reports on the subject is also given.

Social Work at Its Frontiers. American Association of Social Workers, 130 East 22nd Street, New York 10. Packet of loose-leaf articles. $.60. Individual articles, $.05.

Information about social work given through articles on industry and personnel counseling, group work in a hospital recreation program, War Relocation Authority Program, immigration and naturalization service, day care for children, Selective Service Administration.

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Newman, Dorothy K. *The Woman Counselor in War Industries: An Effective System.* Women's Bureau, U. S. Department of Labor, 1943. Pp. 14.

A system that has proved effective in many airframe, shipyards, and munitions plants. The functions of the woman counselor, her qualifications, her relationship to the plant's personnel program are outlined. The most important qualifications besides good health are "such anomalous but precious traits as good common sense and judgment, leadership and organizing ability, initiative, imagination coupled with good practical sense, equable temperament, humor, and ability to work well with others."

Controlling Absenteeism. Division of Labor Standards, U. S. Department of Labor, 1943. Supt. of Documents, U. S. Government Printing Office, Washington, D. C. $.10.

A summary of methods of control used by some 200 war plants who recorded with the Division of Labor Standards their plant experience. It is recognized that absenteeism is a human problem, that a certain amount is unavoidable, that the causes are diverse.

Johnson, William H. *Program for Conserving Our Superior Elementary School Students.* Reprinted from Educational Administration and Supervision, February, 1943.

How we can best conserve the junior manpower in the million exceptional pupils in our elementary schools is considered here, together with a brief account of the Chicago program for handling gifted children. The author is the Chicago Superintendent of Schools.

Carlisle, Norman V. *The Marines in Review.* Felsen, Gregor. *Some Follow the Sea.* New York, Dutton, 1943, 1944. $2.50 each. Illustrated.

The specialized training of the Leathernecks and the history of the Corps is given in *The Marines in Review*, which will appeal not only to potential recruits but to all Americans interested in learning something of the background of the exploits which have made the headlines.

The seagoing adventures of seventeen-year-old Chris in the Merchant Marine are vividly told in *Some Follow the Sea*, by the author of *Submarine Sailor* and *Navy Diver*.

Henderson, Algo D. *Vitalizing Liberal Education.* New York, Harper's, 1944. Pp. 202. $2.50.

A consideration of the purpose, content, and method of the liberal college program and the function of the faculty in teaching the student the art of living in the modern world. Of the need for vocational adjustment the author says: "Since the work in which a person engages occupies most of his productive time, provides his subsistence, and is the principal medium through which he makes his social contribution, it is fair to call selecting and preparing for this lifework a matter of primary concern to the individual." As the president of Antioch College which long has given students the opportunity to have off-campus work experience, Dr. Henderson stresses its value as part of an education.

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Transmitted by Max F. Baer

ARMY SEPARATION CENTER

Number 1: Army Separation Center has been set up at Fort Dix, N. J., by Separation Classification Section, Classification and Replacement Branch, War Department. Center handles men discharged to New York, New Jersey, Delaware. Men are processed in 48 hours. Guidance is done by individuals who were professional vocational counselors in civilian life.

Others? It's reasonable to suppose that similar centers will spring up in other parts of country as need grows.

LABOR MARKET INFORMATION FOR VETS

Area Statements: USES has begun to grind out series of statements giving bird's-eye view of job opportunities in 114 main employment centers of country. Men discharged from Armed Forces will know what's what in all industrial centers with 100,000 population or more and in chief city in every state regardless of size.

Statements will show main war and civilian industries of each area, job outlook for present and six months ahead, plus "guesstimate," wherever possible, of postwar outlook. Also: names of chief firms, kinds of jobs immediately open, hours and wages, housing, cost of living, and community facilities such as schools, hospitals, transportation. Each statement will consist of one page and will be revised every two months.

Not for schools: Schools and other agencies interested in employment situation in different parts of U. S. will have to study area statements in local USES offices. Too bad that only USES offices can get statements.

POST-WAR JOBS IN SHIPBUILDING

Jobs today: U. S. Maritime Commission now keeps 700,000 busy in shipyards and accessory plants, about half of which are on Pacific coast. Another 700,000 or 800,000 are building ships for Navy and Army. Before war U. S. had nearly 12 million dead-weight tons of merchant shipping; by end of this year we may have 35 to 40 million dead-weight tons.

After armistice: If new ship construction keeps on gaining

over subs for another few months, post-war planning for new ships will be waste of time. What to do with most of 1,500,000 shipyard workers is big headache. Fact that such labor is concentrated on Pacific and Gulf coasts where substitute employment won't be promising in short run complicates problem.

POST-WAR JOBS IN CONSTRUCTION

In general: Outlook is bright. You can expect much activity in street and road building and repair, public utilities construction, and residential building. Though war plants must be converted to meet peacetime needs, there won't be boom in industrial building on account of great volume of such construction during defense and war periods.

Housing: Government's advisers on housing expect to see about 1 million houses built each year for ten years after shooting stops. This would give jobs to about 1 million men for on-site work and perhaps 1,300,000 for off-site work in producing construction materials.

Road building: Post-war plans of Public Roads Administration in cooperation with state highway departments may be one of biggest sources of jobs right after armistice. Public Roads Administration officials figure that each $5,000 spent in road building will employ one man directly on job for one year and from 1 1/2 to 2 men indirectly in production of supplies, transportation, etc. Public roads program now before Congress calls for Uncle Sam's dishing out 1 billion dollars each year for three years immediately after war. And if states come through with own programs, at least 2 billions will be spent a year for roads and streets. This would mean jobs for 1 million men. City and county building could give work to another half million. Most of our best main roads are 15 or 20 years old and replacement program would now be in full swing except for war. Post-war work may include building of express highways between cities, belt lines, and bypasses around cities.

NAVY COMMISSIONS FOR WOMEN IN GUIDANCE

Bread for counselors: Top priority in WAVE officer procurement now goes to Navy's educational service program. Applications are now being accepted from women experienced in vocational guidance, distributive education, counseling, placement, training, public relations. Those who make grade will be commissioned and get 5 to 7 weeks' intensive training.

Where to apply: Qualified women between 25 and 35 may get in touch with nearest Office of Naval Officer Procurement.